



Information Services Opportunities
and Trends, 1994-1999

Health Services

U.S. Market Analysis Program



Information Services Opportunities
and Trends, 1994-1999

Health Services

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HEALTH SERVICES INFORMATION SERVICES OPPORTUNITIES & TRENDS

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Health Services

Information Services Opportunities and Trends, 1994-1999

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Abstract

This report examines the issues, trends and other factors (including use of a new database concept, the “megabase”) that will have an impact on the health services industry and those vendors that supply information services to that market. The report also presents a forecast of the purchase of these services for the period 1994 to 1999.

The report analyzes and forecasts the health services market for information services for the product/service categories of professional services, systems integration, outsourcing, processing services, network services, applications software products and turnkey systems.

Issues, trends and other factors affecting the health services industry are analyzed from the perspective of both users and vendors in order to compare vendor plans and user needs and identify possible opportunities where needs are not being addressed. Key topics discussed in this study include the change in the health services industry from a traditional “processing” environment to one emphasizing databases—databases that will be, in some cases, so large that INPUT uses the term “megabases” to describe them. Three scenarios for the growth of the health services industry are presented, and INPUT discusses the one that is used as the basis for INPUT’s information services market forecast. The analysis of the scenario, technology trends and industry issues, together with other research, is used to project the growth in the health services market for information services over the next five years—1994 to 1999.

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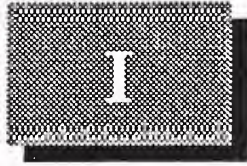
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Introduction

A

Purpose, Methodology and Organization

1. Purpose

There are five basic objectives of this Market Analysis Program vertical market report:

- *Industry Introduction* - Introduce the reader to the structure and demographics of the health services market sector.
- *Business Issues and Trends* - Identify the business issues and trends that are driving the use of information services within the health services sector.
- *Systems Uses and Issues* - Discuss how the health services sector uses information systems, and the issues facing health services information systems organizations.
- *Information Services Market* - Discuss the information services market within the health services sector, including market sizing and factors driving and inhibiting market demand.
- *Competitive Environment* - Discuss the competitive environment and profile a selection of leading information services vendors in the health services market sector.

2. Methodology

Ongoing Research—Much of the data on which this report is based were gathered during 1994 and early 1995 as part of INPUT's ongoing market analysis program. Trends, market sizes, and growth rates are based upon INPUT research and in-depth interviews with users within the health services sector and the IS vendors serving this market. INPUT maintains ongoing relationships with, and a database

of, all users and vendors that it interviews. Interviewees for the research portion of this report were selected from this database of contacts.

Resources—Extensive use was made of INPUT's corporate library located in Mountain View, California. The resources in this library include on-line periodical databases, subscriptions to a broad range of computer and general business periodicals, continually updated files on over 3,000 information services vendors, and the most up-to-date U.S. Department of Commerce publications on industry statistics.

Forecast Estimates—Vendors, when responding to interviews or questionnaires, may be unwilling to provide detailed revenue breakouts by delivery mode or industry. Also, vendors often use different categories of industries and industry segments, or view their services as falling into different delivery modes from those used by INPUT. Thus, INPUT must estimate revenues for these categories on a best-effort basis. For this reason, the delivery mode and individual segment forecasts should be viewed as indicators of general patterns and trends rather than specific, detailed estimates for individual years.

When information is provided by vendors as requested, it is often offered under an agreement of confidentiality. Therefore, vendor rankings based on revenue figures should be viewed as approximations.

3. Organization and Contents of This Report

Following this chapter's introduction of the purpose of the report, an explanation of INPUT's methodology in preparing it, and a general overview of the U.S. economy, the remainder of this report is organized as follows:

Chapter I - Introduction (This chapter).

Chapter II - Executive Overview: Provides a summary of the report, including identification of key forces that are driving the health services industry, the market forecast, and an indication of market and vendor opportunities.

Chapter III - Information Systems Environment: Offers a research-driven analysis of the sources and uses of technology in the health services industry, and identifies health care trends and their impact on the information technology industry. Considered is the changing healthcare IS environment, and the movement from a "processing" to a "database" IS model.

Chapter IV - Information Services Market: Provides forecasts of the health services industry sector's spending on information services for seven product/service categories. This chapter also examines the major forces affecting the information services market and presents three possible scenarios for industry growth.

Chapter V - Competition: Offers a listing of the leading information services vendors to the health services industry, discusses some of the factors that affect the competitive dynamics of the industry, and profiles five representative vendors.

Chapter VI - Conclusions and Recommendations: Reviews the changes occurring in the health services industry and notes their implications for information services. Provides recommendations for vendors.

In addition, there is an appendix:

Appendix A - Presents INPUT's forecast database and reconciliation. The forecast database contains a yearly (1994-1999) forecast of user expenditures by product/service category for the health services industry sector. The forecast reconciliation compares this report's 1993 and 1998 numbers with those provided in INPUT's previous health services report, and explains the reasons for any significant differences.

B

General Business Overview

Although the health services industry sector is, in many ways, driven by different forces from those affecting the overall U.S. economy, the fact remains that providers of health services and vendors of information services and products conduct their activities as part of the U.S. economy. An understanding of the state of that economy helps to set the stage for a consideration of the condition of the health services industry. Although much of this report was written in late 1994, with updates added in 1995 to reflect the resolution (or lack of it) of any national health care initiative, INPUT is including its 1995 general business overview with this document. It offers the same analysis that will be used with the 1995 health services report to be published at the end of this year.

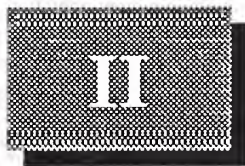
As documented by the U.S. Department of Commerce, economists and business journals, the U.S. economy ended 1994 on a high note—perhaps too high from the Fed's viewpoint—with growth at approximately 4.6%. Since employment has also returned to an acceptable level, there is some concern that the strong growth increases the threat of inflation in 1995. However, January's gain in employment—134,000 people—was well below 1994's monthly average gain of 290,000. This decrease has generally been regarded by both economists and the financial markets as the first solid evidence of slower growth. Most economic observers now feel that growth should slow to around 2% by the third quarter of 1995, giving the American economy what some economists are calling a "soft landing." There is also general agreement that the economy seems to be in a mid-cycle slowdown, and that long-term,

the risk of that slowdown becoming another period of recession in late 1995 is low.

From a financial markets viewpoint, in 1994 bond yields rose nearly 200 basis points, and the Federal Funds rate was up 250 basis points. In 1995 most market analysts expect the Fed rate to top out at 6.5%, bond yields to move sideways in the range of 7.5% to 8.0% and S&P 500 earnings to increase approximately 7%—an amount smaller than in 1994. In general, most sectors of the U.S. economy should grow more slowly in 1995 than they did in 1994—the result of slight decreases in productivity and price/cost pressures. U.S. manufacturers are still restructuring, emphasizing cost-cutting and downsizing, and, coupled with the early-1995 weakness of the dollar (especially against the yen), world markets should find U.S. goods attractively priced. Imponderables remain the short-term impact of supports for Mexico's peso and trade disputes with China. Both situations have the potential for significant short-term volatility, but in the long run should have little effect on the U.S. economy's return to modest, steady growth. Inflation in 1995, as measured by the Blue Chip consensus of approximately 50 private-sector economists, is expected to be at a conservative 2.9%, growing slightly through the year 2000 to a maximum of 3.3% (1996 and 1997) and then declining to 3.0 % by the millennium.

The most encouraging sign of a healthy economy was seen recently in a statement by Federal Reserve vice chairman Alan Blinder who noted, on March 9, that "the U.S. economy is downshifting to a more sustainable growth rate." He agreed with Fed chairman Alan Greenspan that the Consumer Price Index probably overstates the rate of inflation by 0.5 to 1.5 percentage points, but did not indicate whether the Fed rates, which have been raised seven times since February, 1994, would be increased again. Most economists and analysts believe that no further increases will be seen in 1995, unless there is a major change in the economy.

Overall, however, the outlook for the U.S. economy in 1995 is for controlled, steady growth in the 5.7% range with inflation at about 3%, and corporate after-tax profits at approximately 7%, down slightly from 1994's 10%.



Executive Summary

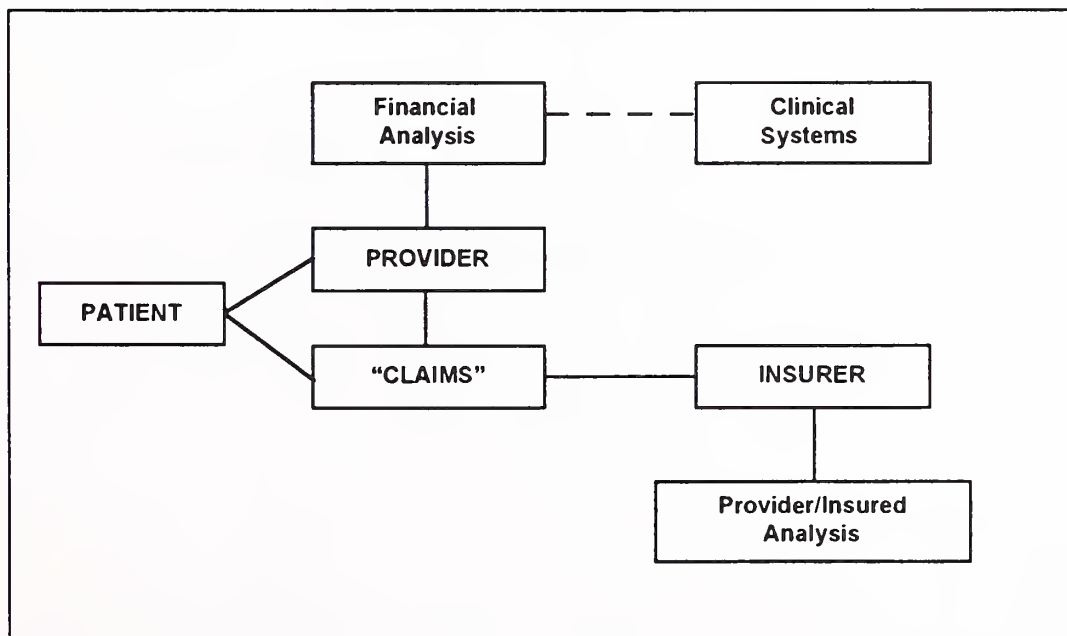
A

Driving Forces

The health care sector is entering a period of profound change as managed care replaces the fee-for-service model. Health care information systems (IS) organizations are going through a similar change due to the switch to managed care organizations (MCO). The old "processing" model (Exhibit II-1) is being replaced by the "database" model (Exhibit II-2).

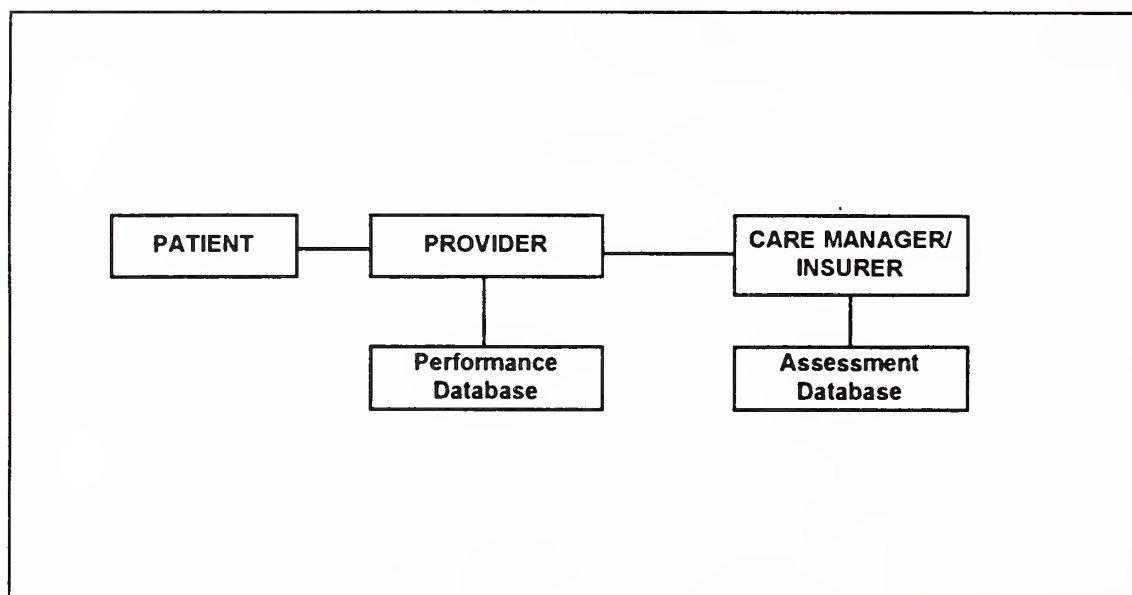
EXHIBIT II-1

Traditional "Processing" Model



Source: INPUT

EXHIBIT II-2

"Database" Model

Source: INPUT

B**Market Forecast**

A market forecast in a time of change should be scenario driven. Exhibit II-3 shows the range of outcomes from three scenarios.

EXHIBIT II-3

**Health Care Information Services Market:
1994-1999(\$ Billions)**

Scenario	1994	1995	1996	1997	1998	1999	CAGR
A	\$6.0	\$6.7	\$7.5	\$9.3	\$11.7	\$14.0	18%
B	6.0	6.7	7.5	8.5	9.6	11.0	13%
C	6.0	6.7	7.3	7.9	8.5	9.0	9%

Source: INPUT

Exhibit II-4 illustrates the scenarios chosen; other scenarios and scenario combinations should be reviewed by individual vendors, depending on the markets they target and their position within the market.

EXHIBIT II-4

Events Producing Scenarios: Health Care Information Services

Representative Scenario Events						
Scenario	Managed Care Growth	Reduction in Claim Volume (1)	Provider Mergers	Specialist "Conversion" (2)	MCO Shakeout	1999 megabase Use
A	High	20%	High	20-50k	No	High
B	Medium	10%	Medium	<20k	No	Medium
C	High	40%	High	>50k	Yes	Low

Note:

(1) From fee-for-service reimbursement

(2) Number of physicians exiting specialties (converting to primary care or leaving medicine)

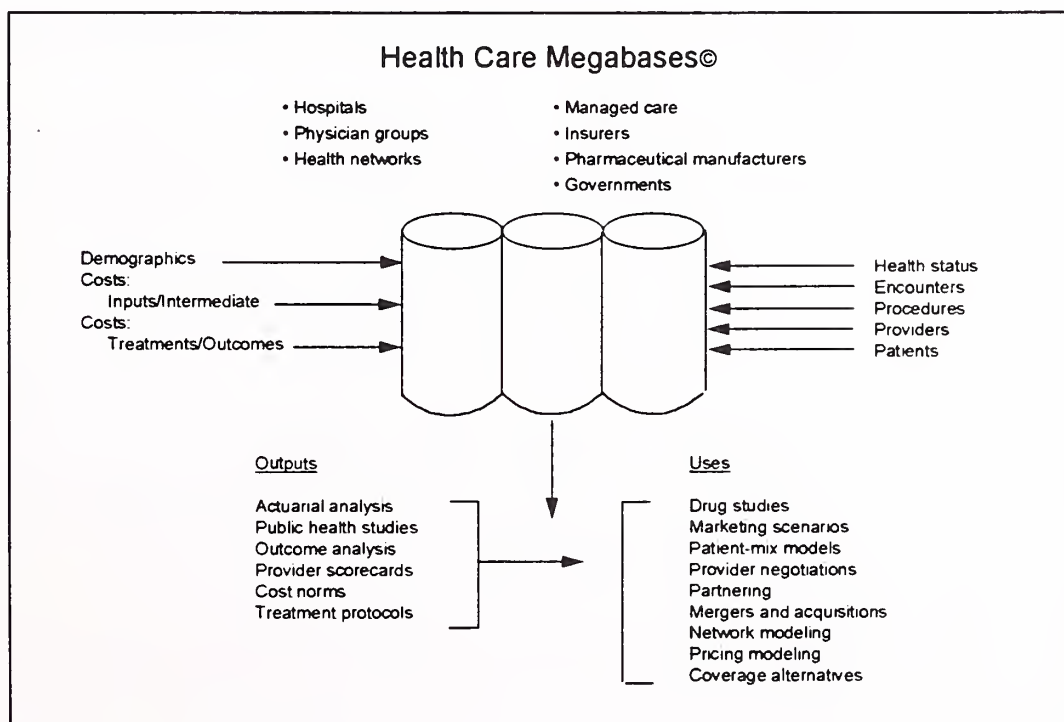
Source: INPUT

C

Market Opportunities

One of the main clusters of opportunity revolves around the "database" model illustrated in Exhibit II-2; the size, extent and importance of data in the managed care environment is so large that INPUT has coined the term "megabase" to describe it; Exhibit II-5 provides a schematic overview of megabase components.

EXHIBIT II-5



Source: INPUT

Megabase-related opportunities include:

- Consulting and design of very large databases
- The initial construction, population and testing of the megabase(s)
- The distribution of publicly available data
- The operations of private megabases
- Advising or executing the analysis of the data
- Providing "hooks" into current or new applications

Another group of opportunities involve supporting provider operations in the new market environment. This includes:

- Providing new packaged applications
- Providing "hooks" into current or new applications
- Customized networks and applications
- Outsourcing some or all IS/business-related functions

D

Vendor Opportunities

In principle, any type of vendor could pursue any opportunity. In reality, vendors will be limited by a combination of:

- Resources available (people and dollars)
- A vendor's base of knowledge
- Market position and perceptions
- A vendor's own view of its heritage ("We provide services"; "We provide software")

Exhibit II- 6 provides INPUT's assessment of the opportunities for which particular classes of vendors are most suitable at the current time.

EXHIBIT II-6

Major Opportunities by Type of Supplier

	Turnkey, Applications Software	Outsourcing, Processing Services	Professional Services, Systems Integration	Database Supplier	Systems Software	MCO, Health Insurer	Providers, Non- Profit Organizations
Megabase-Related							
Consulting/Design			x	x	x	x	x
Construction			x	x	x	x	
Distribution		x		x			
Operations		x		x			x
Analysis	x		x	x	x		x
"Hooks" to Applications	x		x				
Provider Operations							
New Applications	x		x				x
"Hooks" to Applications	x		x				
Customized Netwks, Applications		x	x			x	x
Outsourcing		x					x

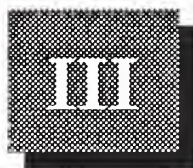
Source: INPUT

Note the types of firms shown in the exhibit that are not now generally regarded as vendors targeting the health services market:

- Systems software firms
- Managed care organizations/health insurers
- Providers and other non-profit organizations

Non-traditional suppliers may prove to be good partners for established health care information service providers.

(BLANK)



Information Systems Environment

The research for this chapter is based on interviews with IS departmental personnel at 52 U.S. hospitals, 26 interviews with vendors of healthcare information systems and services, plus secondary research using other industry sources. The highest concentration of user respondents was from non-profit hospitals—approximately 55%.

A

Sources and Uses of Technology

1. Budgets

Exhibit III-1 shows general patterns found in INPUT interviews and surveys from industry sources about information systems budgets in the health care industry.

EXHIBIT III-1

Health Care Information Systems Budgets

- Budget becoming more centralized
- Budgets range from 0.5% to 3% of revenues
- Hospital survey shows information systems budgets now growing after being “flat” in 1993

Source: INPUT

Increasing Centralization - Especially among hospitals (where decentralized turnkey information systems purchases were the pattern in the past), there is a trend toward more centralized

control of information systems budgets and spending. This is driven both by the necessity to manage information more carefully to meet managed care accountability requirements, and by strategic thrusts toward systems integration—especially of departmentally purchased systems—in a drive to improve service throughout the hospital.

Budget Range - Health care industry information systems budgets (including hardware, salaries and all other products and services) range widely—from 0.5% to 3% of revenues—based both on the segment of the health care industry and the specific situation of each institution. Nursing homes and similar residence institutions, for example, generally have the least complex and costly IS requirements; these are estimated to average just 1% of the budget. Clinics and other groups of professionals—and, to a lesser extent, individual physicians' offices—are spending relatively more, both for computerization (or for upgrades from turnkey minicomputer systems to networked client/server systems) and to integrate with one or more local hospital systems. Their average IS spending is estimated at 2% of revenues. Hospitals' needs are the most complex, but even their information systems spending varies widely, depending on budget constraints, the state of their systems, and significant variables such as transitions from processing services to in-house operations or from mainframe (or minicomputer) processing to a networked system. Observers of hospital systems generally agree, however, that 2% to 3% is at the high end of what most hospitals spend on information systems.

Hospital IT Budget Trends - A recent survey of hospital IS department personnel and discussions with a number of health care information services vendors indicate that after a period in 1993 when hospital IS spending flattened or declined in anticipation of legislated health care reform, a resurgence in health care IS spending occurred in 1994. Sources attribute the rebound to a general belief in the health care provider community that the trend to managed care is inevitable, regardless of any legislative mandates. The belief is driven by both employer and general social pressures for cost control—which equates to managed care.

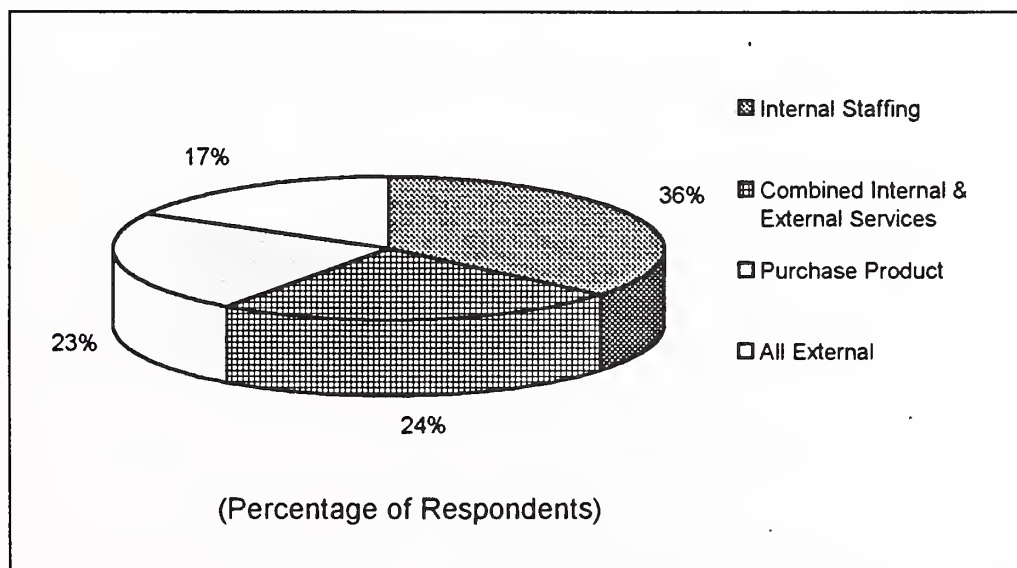
Specific health care IS budget findings among the INPUT survey respondents showed that:

- Thirty-five percent experienced a significant increase in their IS budget over the last year.
- Thirty-seven percent of respondents to INPUT's survey of hospital IS departments indicated that IS budgets in 1994 showed a modest increase. Only 4% indicated that there had been a significant decrease.
- Of the more than 1,000 professional respondents to the 1994 Healthcare Information Management and Systems Society (HIMSS) Leadership Survey (co-sponsored by HIMMS and Hewlett-Packard), "Trends in Healthcare Computing," 52% indicated that planned IS investments at their health care institutions would increase greatly over the next two years.

Exhibit III -2 depicts recent application spending allocations between internal and external sources in INPUT's 1994 hospital IS department survey.

EXHIBIT III-2

Allocation of Application Spending among Internal and External Sources at Surveyed U.S. Hospitals



Sample Size = 52

Source: INPUT

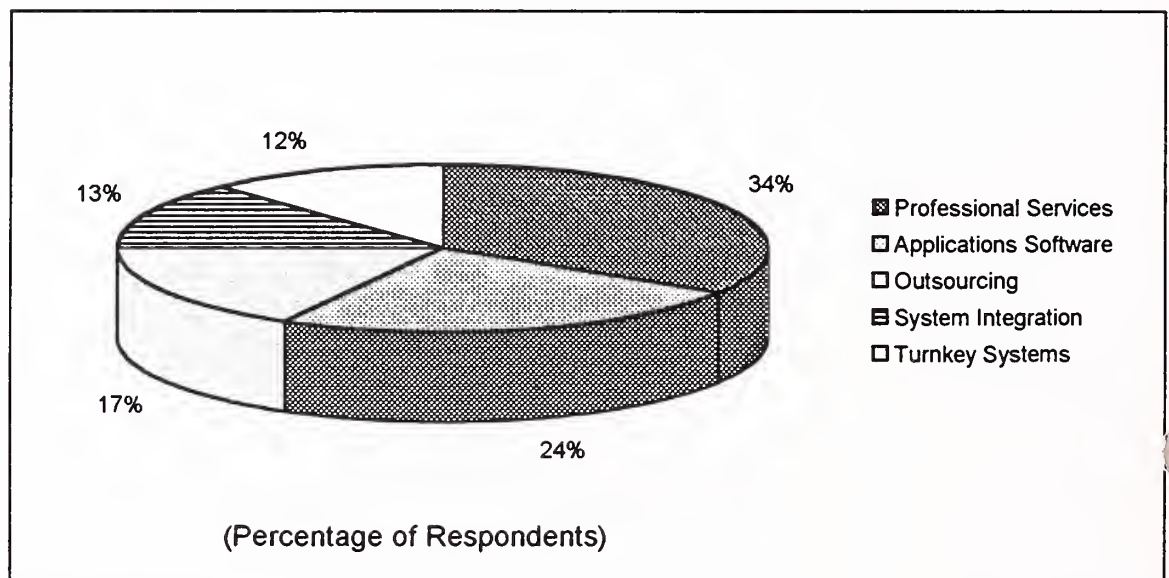
This sample of hospital IS departments indicates that between one-half and two-thirds of the total budget for application development represents potential business for information services vendors. This includes purchased product, outsourced services, and combined development programs.

This includes purchased product, outsourced services, and combined development programs.

Exhibit III-3 depicts the allocation by product/service category of external and combined (external/internal) spending in 1994 among IS departmental respondents to INPUT's hospital survey.

EXHIBIT III-3

Allocation by Product/Service Category of External and Combined Internal/External Spending by Hospital IS Departments



Sample Size = 52

Source: INPUT

The relatively high level of spending for professional services reflects the current importance of services such as product customization, education and training, other product support and business process reengineering. However, there exist numerous definitions by users of the terms "professional services" and "systems integration," and they tend to be used interchangeably for applications such as network and data integration. Thus, the results of this survey more conclusively indicate that the combination of professional services and systems integration represented 47% of external spending on applications in the 1994 IS health care budgets of IS departmental respondents. The addition of outsourcing services brings the total to almost 65% of total external spending on serviced-based applications.

The relatively low level of spending for turnkey systems products can also be somewhat misleading, in that users often do not

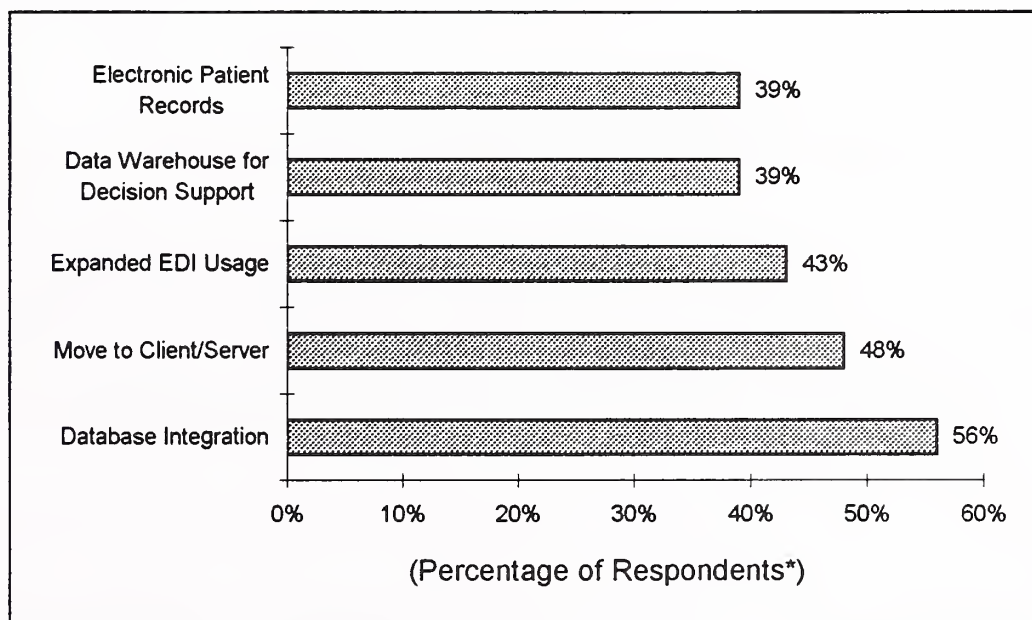
distinguish between a product delivered as a turnkey system solution or as application software product. However, the results also reflect the trend toward client/server architectures, based on open systems platforms for managed care software products. Managed care software products will be one of the fastest growing segments in the health care information services market over the next several years.

The combination of the two product-oriented categories (applications software and turnkey systems) shows that 36% of external application spending in 1994 budgets was for product-centered solutions.

Exhibit III-4 points out directional trends in hospital IS spending on new applications, as identified in INPUT's user survey. Database integration within a centralized IS environment, as well as the movement toward a distributed, client/server architecture for decision support, are dominant directional themes.

EXHIBIT III-4

Focus of Hospital IS Spending on New Applications in 1993-1994



*Multiple Responses Permitted

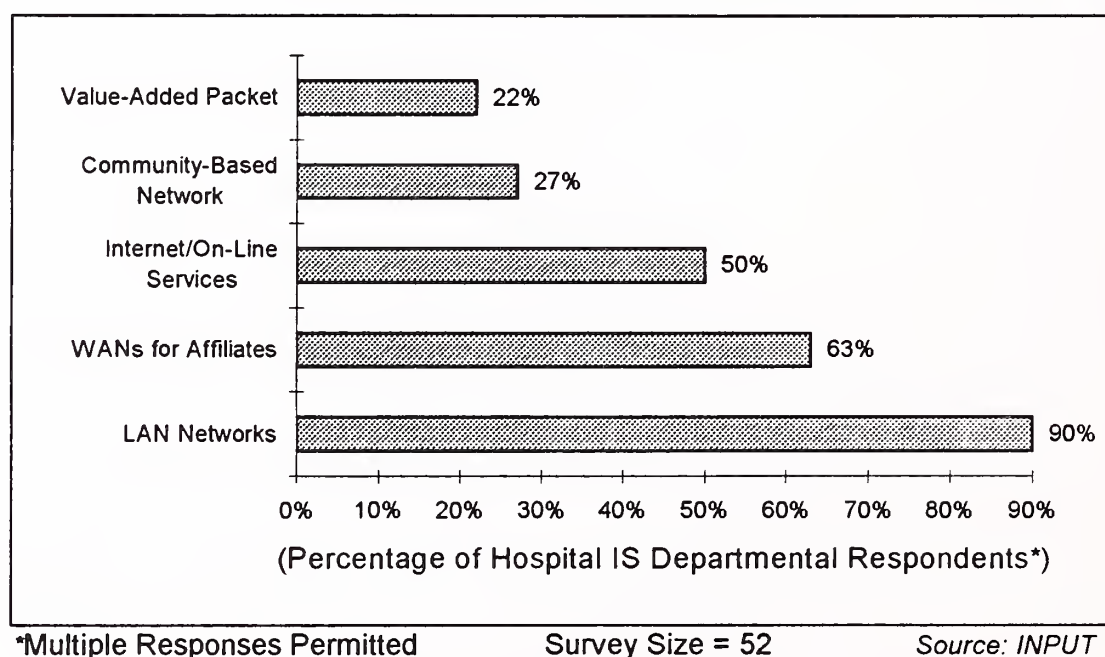
Source: INPUT

The largest investments by hospitals over the next two years will be for:

- Patient care and bedside systems (point of care)
- Relational DBMS software and related application development tools
- Data integration software products (interface engines) and services to provide access to the patient record across the continuum of care
- Managed care software products and custom development—particularly for case management/patient care solutions

The hospitals surveyed by INPUT showed that data networks for delivery of health care services are extensively used. The major market opportunities for network integration and network services lie in the establishment and management of both wide-area networks (WANs) for sharing community-based health services, and local-area networks (LANs), as indicated in Exhibit III-5. Internet and other on-line services were mentioned almost twice as often as value-added and community-based networks.

EXHIBIT III-5

Current Use of Data Networks for Delivery of Health Care Services

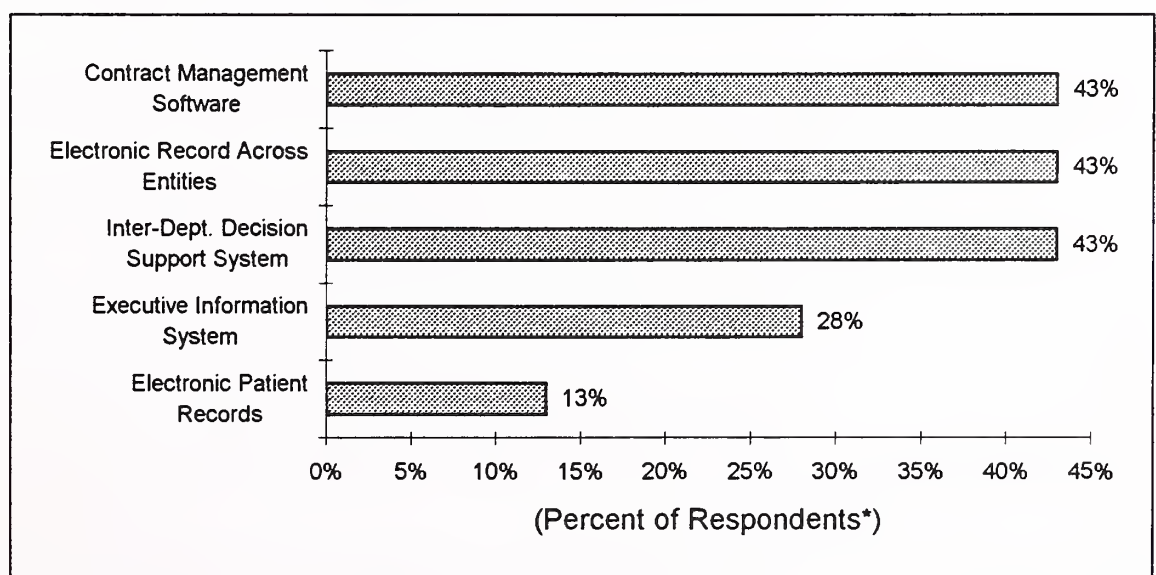
The responses also indicate that the use of EDI for claims processing is still at a relatively low level compared to alternatives such as paper-based forms processing.

Recent trends in software application development and product purchases among the hospital IS departments surveyed showed that the establishment of electronic-based patient records, especially at individual health care sites, is a major development activity (see Exhibit III-6). However, INPUT's vendor surveys indicate that only an estimated 5% of the electronic patient record for the continuum of care has been built. The 1994 HIMSS/Hewlett-Packard Leadership Survey, alluded to earlier, indicated that health care professionals thought a nationwide system for sharing computerized patient information could be up to 10 years away from becoming a reality.

There is also considerable debate on whether there is a need for centralized repositories. Many health care information services vendors surveyed by INPUT thought it would be much more realistic to build distributed electronic patient records. Besides the major issue of patient privacy, the technological issue of being able to store and extract meaningful information from vast quantities of complex patient data records is almost overwhelming. Thus, distributed data warehouses built with object-oriented technology are the most probable technological solution for the electronic patient record.

EXHIBIT III-6

Hospital Activities Addressed by New Software Applications Deployed Over the Past Year



*Multiple Responses Permitted

Sample Size = 52

Source: INPUT

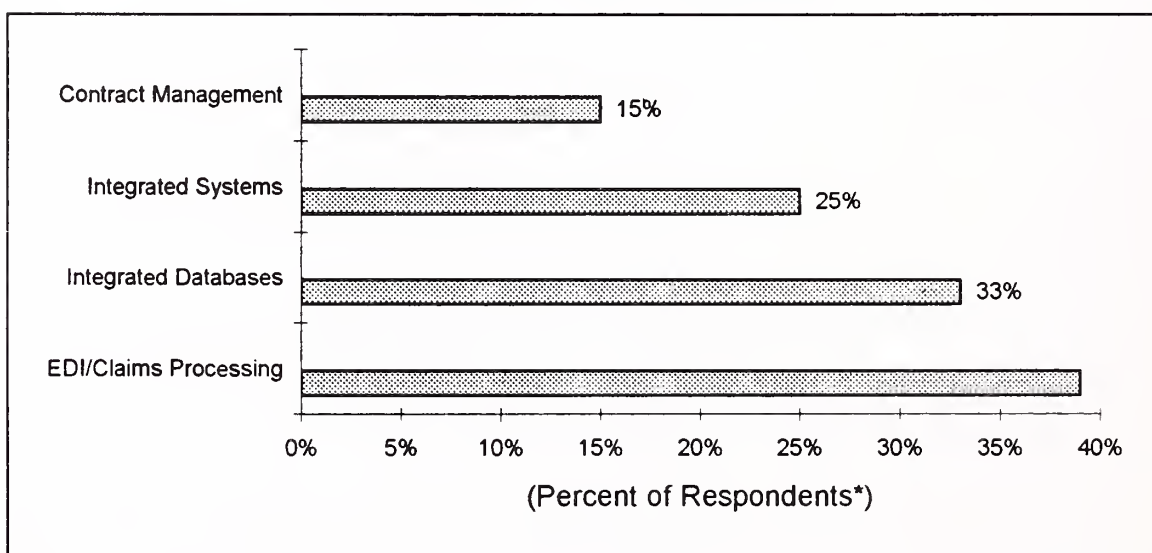
In addition to electronic patient records, key applications deployed over the last year (1994) include executive information and inter-departmental decision support systems.

The specific managed care application presented in the survey, contract management, received the lowest deployment ranking. Although contract management should be one of the first managed care applications, more sophisticated managed care applications, such as case management, are still in the early stages of development. Also, such solutions generally require third-party developers who have access to patient statistics across a number of health care entities to apply industry standards as a basis for measuring efficiency and quality of treatment.

Survey participants were asked to assess what innovations in health care information solutions had produced the most significant cost/benefit improvements for their institutions. As shown in Exhibit III-7, there was no standout application.

EXHIBIT III-7

Installed Health Care Information Technology Perceived as Providing the Greatest Savings



*Multiple Choices Permitted

Source: INPUT

Other technologies mentioned by respondents were imaging processing and data warehouses. Because the survey asked about applications deployed retrospectively, the results also suggest that until recently there has not been much attention placed on computer applications that could achieve significant cost savings.

The 1994 HIMSS/Hewlett-Packard Leadership Survey, "Trends in Healthcare Computing" assessment of the use of more advanced computer applications in health care (i.e., critical path automation and point-of-care systems) showed relatively low levels of usage. Only 19% of respondents had implemented critical path automation initiatives, and the highest level of use of point-of-care systems, 33%, was in critical care settings.

Respondents were also asked to list information technology deployment at their institutions that they perceived as having improved the quality of health care delivery. The following include some of the more frequent responses:

- Integrated delivery systems
- Community-based sharing of the electronic patient record
- User-friendly data query and report writing tools
- New systems development from the clinical practitioner side
- Client/server technology
- High-speed networks
- Adoption of the HL7 standard for database integration
- Distributed access to patient database information from all hospital departments
- Distributed, pen-based computing
- Measurement of treatment outcomes
- EDI claims processing

2. Hot Technologies

Many hot new technologies, listed in Exhibit III-8, are affecting the way the medical industry designs and implements information systems.

EXHIBIT III-8

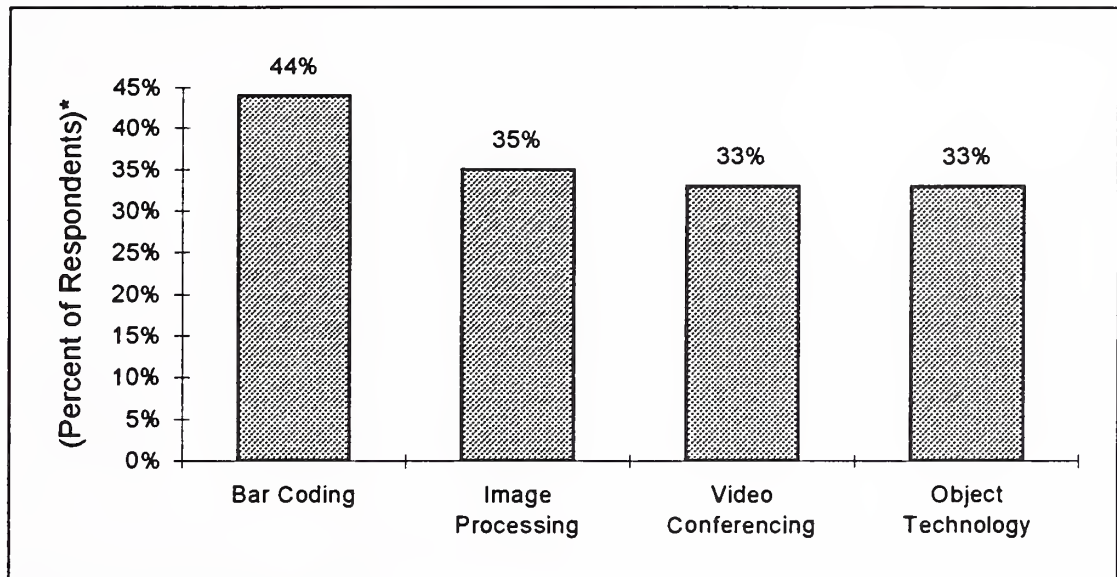
Hot Technologies for Health Care Delivery

Patient-care/medical records information systems
Smart cards
LAN-based/optical fiber medical community networking
Medical community networking
"Open systems" networking
Client/server networked workstations
Image storage and access
Physician information systems
Touch-screen technology
Tablet/pen-based/radio-connected portable systems
Expert systems
Voice recognition
Executive information systems
RDBMSs
EDI

Source: INPUT

Among hospitals surveyed in 1994 by INPUT, bar coding represented the technology with the highest adoption rate in 1994 (see Exhibit III-9), followed by image processing, video conferencing and the use of object technology.

EXHIBIT III-9

Technologies Implemented in 1994

*Multiple Responses Permitted

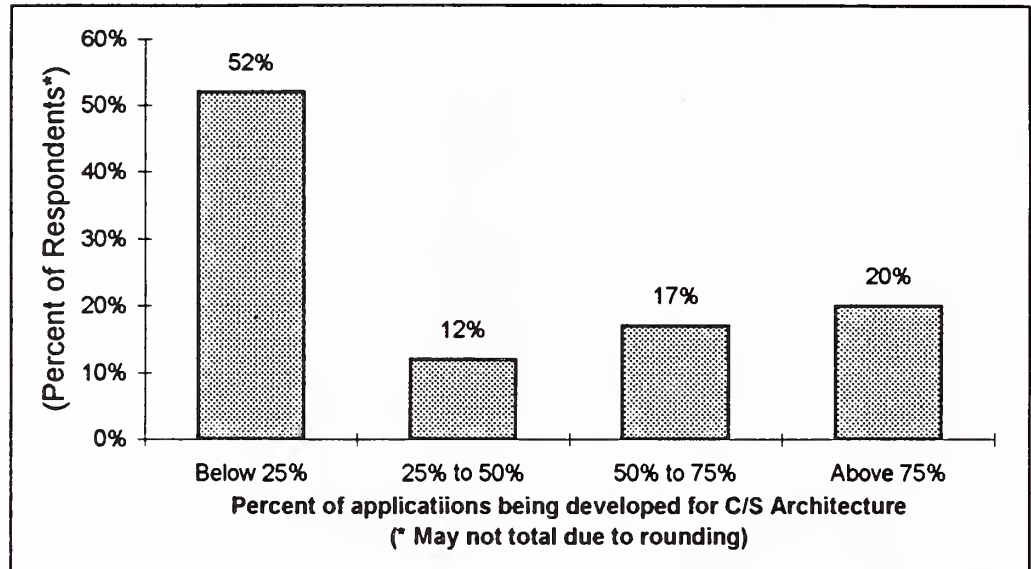
Source: INPUT

Hospitals have been slow to adopt client/server technologies. One of the principal reasons for this may be the high percentage of hospital applications that are considered mission-critical, and the perceived immaturity of the early generations of client/server architectures.

INPUT's hospital survey indicated that 36% of respondents were developing over half of their new applications for a client/server architecture, as shown in Exhibit III-10.

EXHIBIT III-10

Percentage Distribution of New Applications Being Written for a Client/Server Architecture

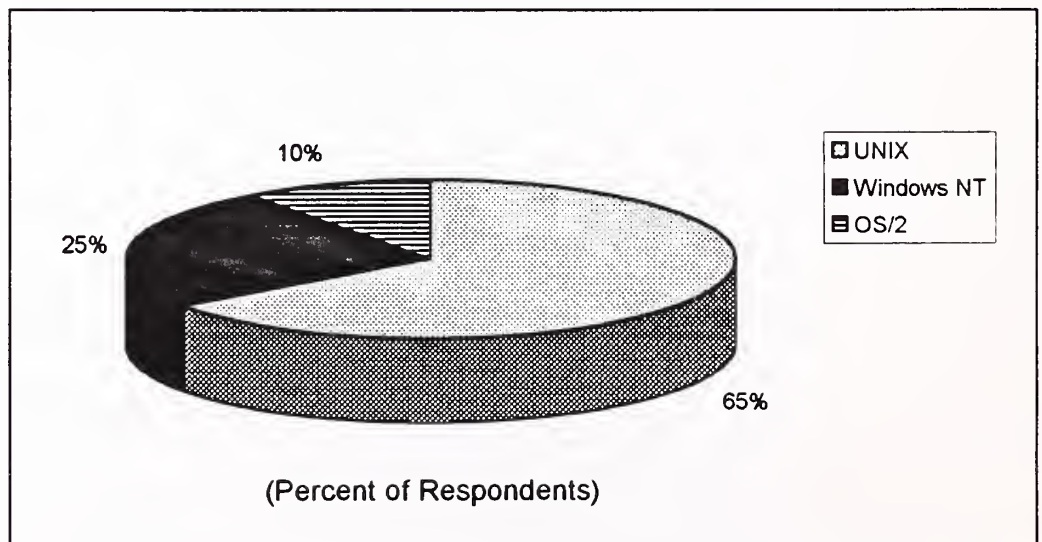


Source: INPUT

The user survey also asked respondents to indicate their preferences among three different operating systems, as a foundation for future client/server applications. The UNIX operating system was the first choice of 65% of the respondents (see Exhibit III-11).

EXHIBIT III-11

Operating Systems Preference for Future Implementation of Client/Server Architectures



Source: INPUT

Some vendors indicated that Windows NT would be a consideration in their future development plans. Others appeared cautious of developing for early generations of a new operating system. Some respondents also mentioned that preferences for open systems in the health care community did not necessarily mean support for UNIX.

3. The Electronic Medical Record (EMR)

Health reform initiatives are generally focused on reducing costs in health care delivery while at the same time improving the quality of care. Important to the implementation of regional and national health care initiatives is the ability to carefully track and document information such as the cost of patient treatment by various health care providers, the quality of outcomes, and statistics on the health status of various populations. Data repositories, which store such information, and which can be accessed by health care providers across the continuum of patient care, is a core technology for the successful implementation of managed health care programs.

Major ways in which the electronic patient record will reduce health care costs include reducing the redundancies in paperwork administration; providing evidence of unnecessary or inefficient treatment; and providing for on-line patient care diagnostics based on standard treatment protocols.

Such data repositories are variously known as the computer-based patient record, the electronic medical record, the longitudinal patient record, or a data warehouse.

A projection of the potential size of the electronic medical record market must take into account such variables as the total number of existent (largely paper) medical records and levels of use of each record. One estimate of the potential market for the electronic patient record is based on U.S. population projections. By the year 2000, the U.S. Census Department estimates that the U.S. population will be approximately 275 million. Under a program of universal coverage, data storage costs per individual could average an estimated \$5.00, plus transaction costs. This conservatively places the value of the potential market for the patient electronic record (in five years) at between \$1.5 billion and \$2 billion. The processing of a typical paper-based invoice today is estimated to cost \$20.00.

A major question is whether a national, regional, or individual organizational architecture of the electronic medical record is the more realistic target. Also, since such records should be longitudinal (a birth-to-death record), a basic question is how to design such a database architecture so that it would allow for both query and report generation in a relatively short period of time.

At this stage in the development of the computer-based patient record, the location of the electronic record is primarily within individual organizations. Many of the vendors surveyed by INPUT indicated that they thought the electronic patient record would continue to be based on a distributed architecture at least for the foreseeable future.

Major problems in developing a national electronic record include the lack of standards between states and the federal government on patient care identification, and the broad diversity of hardware and software platforms from which data must be extracted. In addition, health care institutions have historically consisted of departmental "islands of information."

Currently, most enterprise-based electronic records capture specific episodes of care, primarily for inpatient care, and for a limited period of time. In addition, the longitudinal patient record does exist in some institutions.

Development of the electronic record will provide a major market opportunity for health care information services vendors. Beginning at the individual organizational level, there exist at least three major technological challenges:

- The development of industry standards for data communication and database structure of the electronic record. This challenge is currently being addressed by a number of standards organizations, such as: the Health Level Seven (HL-7) standards group, which represents vendors, consultants and health care organizations who are jointly developing interface communications standards; Medical Data Interchange (MEDIX), which is addressing such standards from a worldwide perspective; and The American Society of Testing and Materials (ASTM), which is one of a number of groups working on developing data model standards for the content of a patient's automated record.

- The development of database user interface tools that both encourage and allow a variety of health care provider personnel to effectively use the database repository
- The development of on-line, real-time distributed database technology that represents, in effect, the next generation of client/server architecture

Legal and privacy issues regarding authorizing the use of patient record databases could also be significant obstacles.

The technological challenges of building real-time distributed database architectures that allow for complex, multidimensional data reporting will require the talents of vendors with strong skill sets in systems software and systems integration. Object-oriented application development tools, relational database management architectures, and parallel processor server platforms will be key technology requirements for building production-level distributed database architectures.

The electronic record will also require enterprise-wide distributed database architectures, with specialized data warehouse repositories for decision support applications. This level of client/server application development is in the very beginning stage of deployment within any industry.

In addition, companies that provide such technological solutions must also have in-depth knowledge of the health care industry to provide analytical and actuarial value-added capabilities.

Individual systems software companies have been developing specialized multidimensional database management systems and associated development tools that could be applied to the health care industry. Currently, this technology is being used primarily in the consumer products and sales and marketing industries. The Sachs Group, profiled in Chapter V of this report, provides data services and tools for reducing the complexity of data access. Other companies are working on the data interface technology.

The specialized market for multidimensional databases, associated development and data access tools is the basis of the emerging market for on-line analytical processing (OLAP). The data access resources provide a variety of tools (EIS and decision support) for end-user access to multidimensional databases.

Vendors in the OLAP market include companies such as Information Resources, Pilot Software, Red Brick, Sachs Group, and Inmon.

A wide range of health care information services vendors offer varying implementations of the electronic patient record. Despite the breadth of product and service offerings, virtually none are comprehensive or fully integrated.

B

Health Care Trends and Impact on the IT Industry

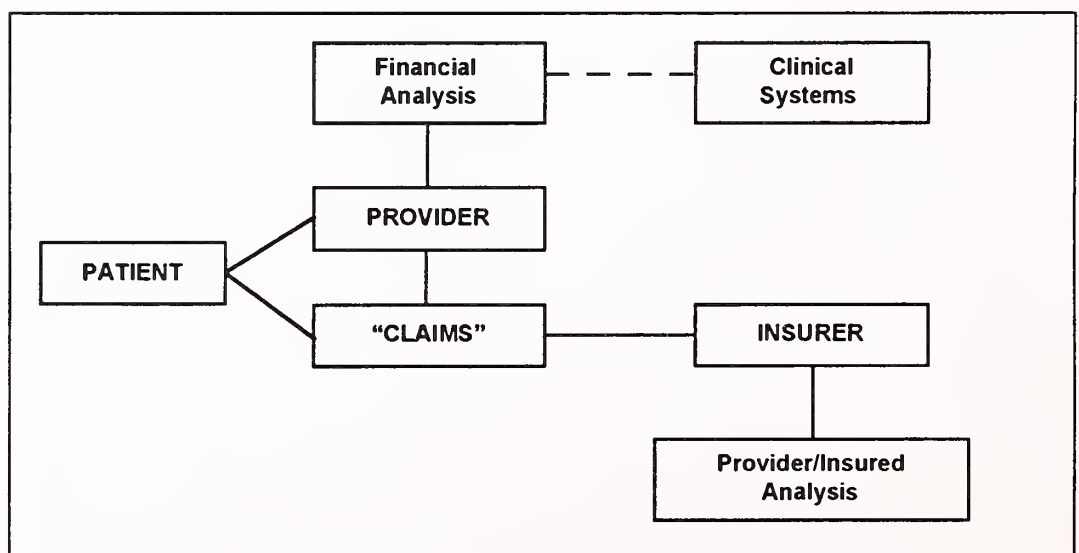
1. The Traditional "Processing" Model of Health Care

For the last thirty years (i.e., since Medicare), the health care system has been driven by fee-for-service reimbursement maximization which from a systems standpoint has in turn been driven by claims processing.

Enormous amounts of data are collected to generate proof that the service has been rendered, which is then sent to an insurer for payment. A certain amount of the data is retained for cost finding and rate setting, but most of the data is literally discarded. Exhibit III-12 illustrates the traditional process.

Exhibit III-12

Traditional "Processing" Model



Source: INPUT

A large industry has grown to support this process:

- Revenue maximization consultants to hospitals
- Administrative support software for hospitals
- Outsourcers to support insurance processing functions, e.g.,
 - Workflow processing
 - Computer-assisted decision making
 - Customer service and support
 - Payments and reporting

The claims submission/reimbursement process consumes about \$50 billion annually (spread among health care providers, insurers and information services and software providers), with few improvements to health care or cost control.

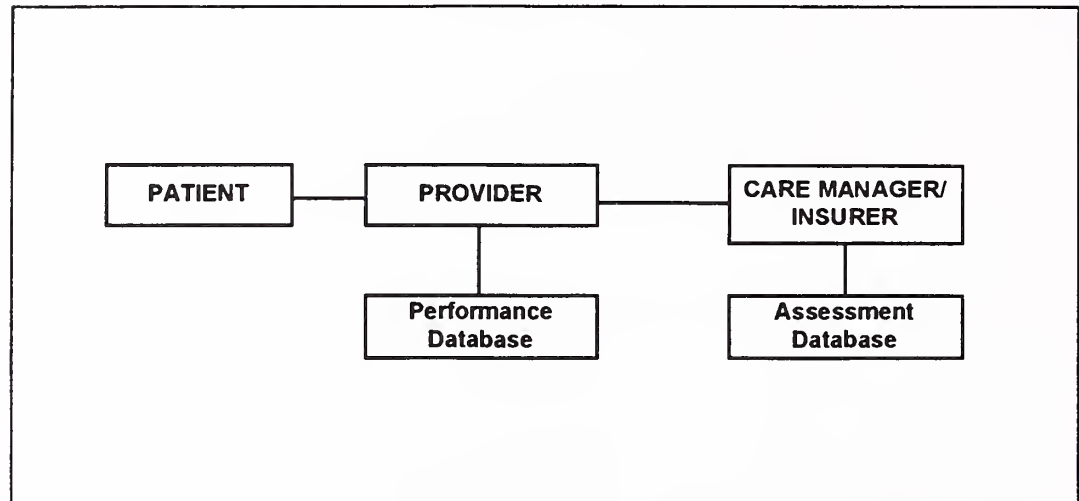
2. The Impact of Managed Care: The "Database" Model

Managed care greatly reduces (sometimes virtually eliminates) the transaction processing stream of the traditional model.

This is not to say that data processing needs diminish—they are changed. In what might be termed the "database" model, both providers of care and care managers/insurers will need access to large collections of data about patients, their treatment and underlying costs. Exhibit III-13 provides a schematic of the database model.

Exhibit III-13

Database Model



Source: INPUT

a. Needs of Providers

Providers of care will need to use large, customized databases to respond to the challenges of the managed care environment. Similar work may have gone on in the past, but never at the same level of intensity. It is no exaggeration to say that the well-being, often survival, of the provider will depend on the successful use of data. Following are examples of the kinds of data-based activities that will be routinely conducted by providers in a managed care environment.

Examples of Data Types

The following are examples of the types of data necessary to function in a managed care environment. INPUT expects the breadth and depth of data utilized to become increasingly complex as data becomes a key competitive tool.

- Characteristics of current patients, in terms of demographics, socioeconomics, diagnosis and treatment profiles, etc.
- Costs and profitability by type of patient, diagnosis and treatment
- The effect on utilization and profitability of changing the patient mix by means of changes in:
 - Services offered

- Marketing
- Physician recruitment
- Building or joining provider networks
- Managed care contract terms
- Affiliations with managed care organizations
- Assessing the financial effects and impact on services of affiliations with other providers
- Classifying physicians from the standpoint of quality, cost and revenue generation
- A self-assessment of a provider in terms of:
 - Cost
 - Outcomes
 - Customer satisfaction
 - Past, current and expected performance
 - Individual services provided
 - Patient mix
 - National, regional and local norms
- In-depth analysis to determine the reasons for a provider's variance from norms, and actions that can be taken to adjust or improve the provider's position

Examples of Data Uses

The types of data described in the preceding section will be the foundation for negotiations with not only managed care organizations, but also with:

- Physician groups
- Other provider networks

- Traditional insurers and other reimbursers, as all reimbursement becomes competitive

Managed care organizations already use data to obtain the best terms possible with providers. Providers must, in turn, learn to use data to strengthen their own position.

Providers will use the data in other, related ways—for example, to:

- Identify services in which they have a competitive edge in terms of cost, quality, attractiveness, etc.
- Improve other services—and measure the effects of changes
- Experiment with the effects of different delivery mechanisms on revenue and customer satisfaction
- Identify the attributes of optimum delivery partners and identify candidates that come closest to the profile
- Develop one or more targeted marketing plans and track the effects
- Reduce costs and model the impact before and after implementation (by comparing themselves to other providers)

b. Needs of Managed Care Organizations

A managed care organization (MCO) needs, essentially, supersets of the data that are required by individual providers. MCOs already collect and use large amounts of data. However, market conditions will require larger and more sophisticated analyses in the future, including:

- The cost to employers of traditional health insurance has until now provided a price umbrella for MCOs. As more competition develops between MCOs, "pricing pencils" will have to be sharpened.
- Similarly, some providers are now uncertain and ill-informed in their dealings with MCOs. It does not take a very astute MCO to negotiate a good deal (for itself) with providers. The Darwinian struggle now going on among providers will create fewer, smarter provider groups.

Examples of Data Types

Ultimately, there will be no health-related data that an MCO will not be able to use to improve its performance. High spots include:

- Demographics of the patients that it covers. (Highlighting any differences between the population that it covers—or a subset—and the characteristics of a population it might potentially cover.)
- Encounters and episodes
 - Variations and causes
 - Actual treatments versus best practice protocols
- Service utilization (again, compared to equivalent norms, both regional and national)
 - Overall utilization
 - Profiles of individual diagnoses/treatments compared to typical and best practices
- Individual and collective provider profiles
 - Cost and outcomes (segmented)
 - In-network versus out-of-network
 - Provider scorecards (public and private)

Examples of Data Uses

A key characteristic of a successful MCO is the ability to correctly assess and price risk, using both traditional and innovative actuarial methods.

- The setting of prices (to employers) and payments (to providers) will become increasingly complex and sophisticated. Data, correctly mobilized, will be the main differentiator in these negotiations.
- The pre-negotiation "homework" will analyze potential new blocks of patients and profile and compare potential providers.

Tracking of providers already part of an MCO's network will be critical for balancing cost control against quality and customer satisfaction.

Currently, databases are of secondary importance in marketing directly to prospective patients (because employers generally give their employees a choice of MCOs). In the future, INPUT believes that database-driven marketing will become much more important; similar conceptually, although not operationally, to the use of databases in the direct marketing of other consumer-oriented products and services.

As the health care system rearranges itself, some large providers may capitate (charge a certain amount per member) other subproviders. These large providers will take on aspects of a managed care organization.

c. Needs of Traditional Insurers

As mentioned in the prior section, a key characteristic of a successful MCO is the ability to correctly assess and price risk, using both traditional and innovative actuarial methods. That is, an MCO is in many respects an insurer.

Strangely enough, a large part of the business of traditional fee-for-service health "insurers" does not involve risk assessment and pricing. Over the past 20 years, the largest customers of traditional health insurers have been paid whatever the reimbursement costs turned out to be. Much of the business of so-called health insurers was actually health claims processing (or "administrative services only" in the jargon of the trade). This situation was quite satisfactory to the traditional insurance companies, since most had consistently lost money on health insurance they underwrote themselves—premiums could not keep up with medical inflation.

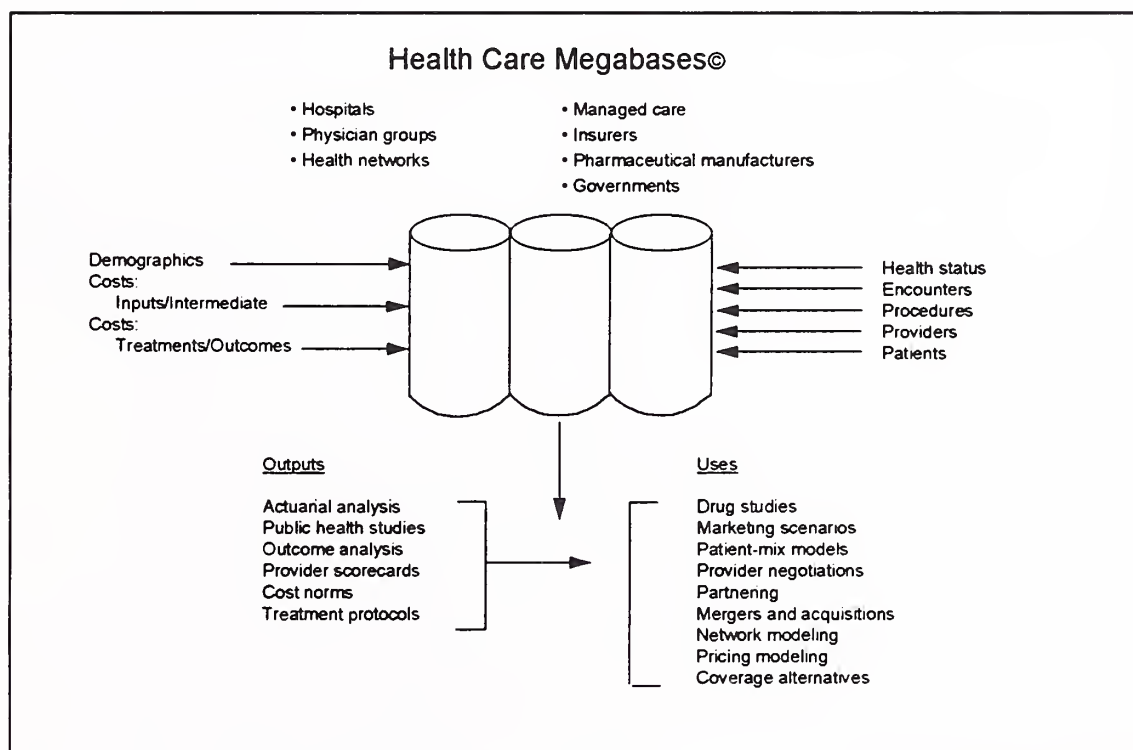
Ironically, one of the main tasks facing traditional insurers is relearning the insurance business as they try to enter the MCO environment. Companies are being pushed into the MCO business, whether they want to be there or not, because providers are trying to recoup dollars lost from MCO patients by increasing their fee-for-service revenues.

Putting to one side the learning curve and related attitude changes required, the need for data by traditional insurers is identical to that of the MCOs—given the fact that traditional insurers, main competition and growth area is managed care.

3. The "Megabase" Environment

Up to this point in the analysis, the data needs of participants in managed care have been described in general terms of requiring large databases. Actually, the databases will, in INPUT's view, be extremely large. To highlight this fact, INPUT has created the term "health care megabases" to describe these stores of data (see Exhibit III-14).

Exhibit III-14



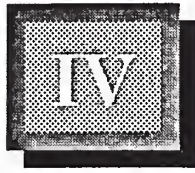
Source: INPUT

The "megabase" is much more than just a database or technical environment. The following components will be needed to make the megabase work:

- A thorough understanding of how an organization's business objectives (as well as more tactical activities) relate to data
- Specific content knowledge in such areas as:

- Cost components
- Medical practice
- Demographics
- Health marketing
- Identification of the specific data elements, their source and data structures
- The DBMS and related access methods
- Analytic tools, including:
 - Data retrieval and analysis packages
 - Actuarial methods
 - Executive information systems

Megabases will be made up of a combination of off-the-shelf and customized components. The proportions will be determined by level of need and resources available.



Information Services Market

A

Major Forces Affecting The Information Services Market

1. Driving Forces

The most significant long-term trend is the need for very large databases in a managed care environment (megabases). The rationales for this were discussed in the previous chapter.

Other impacts of managed care include:

- Changes in the attitude toward and use of cost accounting.
 - Until recently, health care providers (especially hospitals) viewed cost accounting primarily as a means of using the reimbursement system to maximize fee-for-service revenues.
 - In the evolving contract-for-services environment, cost accounting will become a tool for stripping out non-essential expenses and supporting higher levels of service.
 - This reorientation will require new sets of financially oriented applications (including core patient care modules).
- The need for integration of information used by providers will be necessary on two levels:
 - Improving or setting up "customer information systems" along the lines used in other industries for ongoing customer contact. Essentially, this would consist of all information about patients, patient families and covered groups served by a provider or group of associated providers. This "CIS" approach overlaps, and is a driver of, megabases.

- Providers that have common business/health care relationships will have to be linked, both at the CIS level and to support ongoing operations. These initiatives will have to show that they pay for themselves; much technology up to now (e.g., electronic medical records, EDI, even client/server implementations) has been an end in itself, regardless of the tangible benefits that are produced.
- The increasing need, in the short and medium terms, for semi-customized systems. Up to now, packaged solutions have predominated. Both current and many future applications will need customization in managed care settings:
 - Provider networks will require bridges—for data, applications and communications networks.
 - Megabases will need two-way links with provider applications and data bases.
 - Long term, these needs will result in a new generation of applications software products; up to that point there will be increases in the level of systems integration services.

Exhibit IV-1 summarizes these driving forces.

Exhibit IV-1

Major Drivers of the Health Care Information Services Market

Managed care's need for very large databases (megabases)

The changed focus of cost accounting: from maximizing fee-for-service reimbursement to cost accounting for minimizing costs

Integration of provider information:

- "Customer information systems" (all information about a patient served by a provider group)
- Provider information networks (linking providers that have a common business/health care relationship)

Need for semi-customized systems in a managed care environment

- New generation of applications/applications software
- Systems integration

Source: INPUT

2. Inhibiting Forces

There are events within the health care industry that will serve to inhibit certain aspects of information services growth. The most significant are:

- The decline of the relative (and, soon, absolute) importance of fee-for-service reimbursement. This will affect providers whose offerings directly or indirectly are built on supporting or maximizing reimbursement.
 - Many of the established applications software and turnkey offerings are in this category.
 - Interestingly enough, one of the newest offerings—EDI services—has been mainly touted as helping traditional reimbursement.
- Managed care is accelerating mergers among providers.
 - In the short run, the impact will be obvious: fewer buyers.
 - In the longer run, the fewer, larger buyers may create a larger number of more self-sufficient provider organizations that will need fewer outside products and services. These larger organizations will often serve as a common buying point for goods and services of all kinds. This will increase the number of large deals possible—in ten years, the number of "hospital buying points" may shrink from 4,000-5,000 to a number in the low hundreds. This will create a double-or-nothing situation for many vendors.
- Not only will there be fewer physician groups under managed care, there will also be fewer physicians overall:
 - Patients may receive about as many minutes per year of doctor time, but this time will be arranged more efficiently, reducing the need for physicians overall.
 - In addition, managed care aims to greatly reduce the number of specialists and specialist procedures: Specialists have historically been disproportionate users of information services.

Exhibit IV-2 summarizes these inhibitors.

Exhibit IV-2

Major Inhibitors in the Health Care Informations Services Market

Decline of fee-for-service reimbursement (impact on current generation of offerings)

Mergers among providers

- Fewer buyers
- Increased number of buyers with critical mass to be self-sufficient

Smaller number of physicians, especially among specialists who have been heavy users of information services

Source: INPUT

3. Summary

The driving forces are more powerful than the inhibitors, in INPUT's opinion.

- The inhibitors will have largely short-term, transitional effects.
- Some of the inhibiting factors (such as mergers) will act as accelerators in other areas (such as megabases).

However, there will be so many different forces at work for the remainder of the 1990s that caution is required in planning.

- The timing of individual factors can have a significant impact on the market in a particular timeframe.
- IS in general, and information services/software in particular, are highly dependent on the larger events in the health care sector.
- Significant government actions affecting health care are almost certainly on "hold" for the next few years. However, the vagaries of politics are such that no long-term plan should assume a free hand indefinitely among managed care organizations.

B**Health Care Information Service Forecasts and Scenarios**

Given the dynamism and variables in the health care sector, INPUT's forecast for 1994-1999 is scenario based (see Exhibit IV-3).

- Scenario A (18% CAGR) assumes a high level of managed care growth, provider mergers and megabase use, with a moderate reduction in claim volume and declining numbers of specialists.
- Scenario C (9% CAGR) assumes a high level of managed care growth and provider mergers, with megabase use accelerating at the end of the period. Claim volume and specialists decline at a much higher rate. Managed care organizations themselves go through a shakeout (reducing the number of buyers).
- Scenario B (13% CAGR) has elements of both A and C. Scenario B is the most likely situation, in INPUT's opinion.

Exhibit IV-3

**Health Care Information Services Market Scenarios, 1994-1999
(\$ Billions)**

Scenario	1994	1995	1996	1997	1998	1999	CAGR
A	\$6.0	\$6.7	\$7.5	\$9.3	\$11.7	\$14.0	18%
B	6.0	6.7	7.5	8.5	9.6	11.0	13%
C	6.0	6.7	7.3	7.9	8.5	9.0	9%

Source: INPUT

Exhibit IV-4 summarizes the assumptions driving each scenario. Although Scenario B is the most likely average, readers should bear in mind that the "average" outcome can also be produced by a combination of highs and lows in different events.

Exhibit IV-4

Events Producing Scenarios: Health Care Information Services

Representative Scenario Events						
Scenario	Managed Care Growth	Reduction in Claim Volume (1)	Provider Mergers	Specialist "Conversion" (2)	MCO Shakeout	1999 megabase Use
A	High	20%	High	20-50k	No	High
B	Medium	10%	Medium	<20k	No	Medium
C	High	40%	High	>50k	Yes	Low

Note:

Source: INPUT

(1) From fee-for-service reimbursement

(2) Number of physicians exiting specialties (converting to primary care or leaving medicine)

Scenarios such as these are most useful as a representation of probabilities to be used as a planning and tracking device. INPUT recommends that each vendor identify the events that are most important to its business and follow them on an organized basis.

C

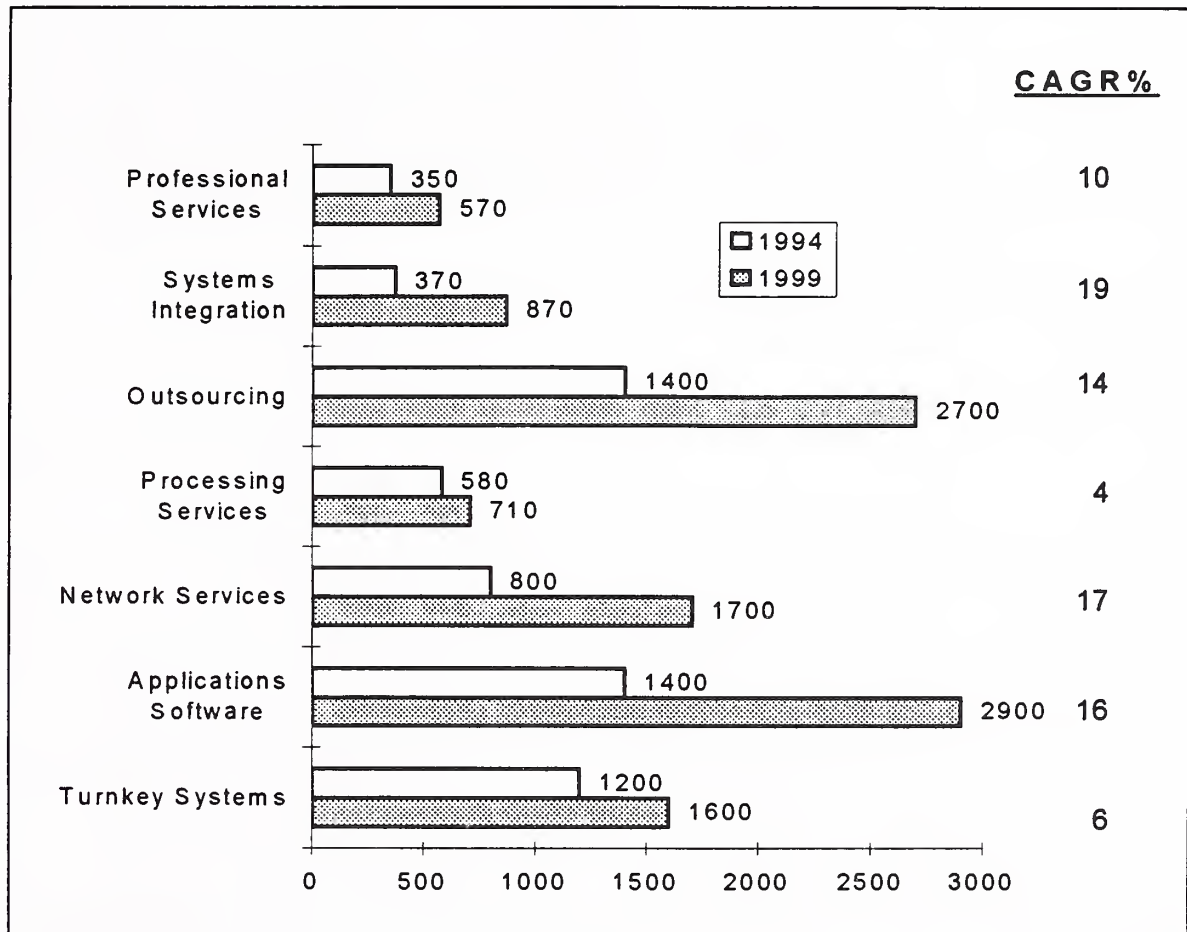
Product/Service Category Forecasts

Exhibit IV-5 segments the 1994-1999 forecast (from Scenario B) into the seven product/service categories tracked by INPUT. In summary:

- Systems integration, outsourcing and applications software growth will all be impacted favorably by managed care over the five-year period.
- Turnkey systems and processing services will be the most negatively affected by the decline in demand for offerings aimed at the historic fee-for-service environment.
- Professional services will be affected somewhat by the installation of new, more comprehensive systems (which will benefit SI and applications software).
- Network services (specifically information data bases) will be benefited by moves to megabases.

Exhibit IV-5

Health Services U. S. Information Services Market by Product/Service Category, 1994-1999 (\$ Millions)



Source: INPUT

Megabases themselves will have an impact on all sectors, as summarized in Exhibit IV-6.

Exhibit IV-6

Impact of Megabase Activity by Product/Service Category

Delivery Mode	Overall 1994 - 1999 CAGR%	Megabase Impact
Professional Services	10%	<ul style="list-style-type: none"> • Megabase consulting • Large-scale DBMS design
Systems Integration	19%	<ul style="list-style-type: none"> • Megabase construction • Tying megabases into existing applications
Outsourcing	14%	<ul style="list-style-type: none"> • Running/maintaining megabases
Processing Services	4%	<ul style="list-style-type: none"> • Negatively impacted by decline of fee-for-service reimbursement
Network Services	17%	<ul style="list-style-type: none"> • Key beneficiary of public/semi-public megabase • Growth could be higher
Applications Software	16%	<ul style="list-style-type: none"> • Megabase modules/hooks into "traditional" applications • Specific tools for megabase analysis
Turnkey Systems	6%	<ul style="list-style-type: none"> • Dedicated megabase analysis engines • Without megabases, sector would be in deep decline

Source: INPUT

D

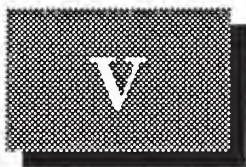
Health Insurance Information Services Market

The information services market for the insurance industry is reported in a separate volume. However, the health insurance information services market has a number of things in common with the health services market:

- The health insurance market is affected by many of the same driving forces.
- As a group, health insurers are transforming themselves into managed care organizations.
- A number of information service vendors provide offerings to both markets.

As noted in Chapter III, the "processing" model is being replaced by the "database" model within the health care industry and, by extension, within health insurance also. In INPUT's view, the only real question is a matter of timing: How long before much processing business goes away—both for the health insurers themselves and for the information services vendors that support them?

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Competition

This chapter lists representative vendors to the health services marketplace and also provides profiles of five selected vendors. The profiles and financial information are based upon data available in late 1994 when only 1993 year-end figures were published by public companies.

A

Information Services Vendors to the Health Services Industry

Exhibit V-1 lists, in alphabetical order, major representative vendors to the health services industry. Besides the name of the company (and division, where appropriate), the exhibit also identifies the city and state in which the headquarters of the company or health services business unit is located, the revenues from health services industry-related products and services, and a notation of the most significant types of information services products or services that are offered. Note that many of the vendors regard themselves as providing support systems for various (or all) types of health services activities, and for this table, INPUT has selected product/service offering categories deemed most significant.

To reasonably contain chart entries in Exhibit V-1, the following abbreviations are used for the indicated information services product/service categories: SI is systems integration; AS is applications software; ProcSvc is processing services; PS is professional services; Outsrc is outsourcing (previously called Systems Operations); NS is network services; and Tky is turnkey systems. If financial data is not available, an N/A is entered in the "Revenue" column.

EXHIBIT V-1

Information Services Vendors to the Health Services Industry

Company Name	Headquarters	1993 U.S. Health Services Industry Revenues (\$M)	Significant Product/Service Offerings
ALLTELL (Systematics Health Care Services)	Atlanta, GA	N/A	AS, ProcSvc, Outsrc
Andersen Consulting	Chicago, IL	81	AS, PS, SI
Cerner Corporation	Kansas City, MO	120	AS, Tky
Citation Computer Systems, Inc.	Chesterfield, MO	20	AS, PS
Clini-Com	Boulder, CO	20	AS, PS, Tky
CSC Healthcare Systems	Farmington Hills, MI	35	SW, SI, Outsrc
CyCare Systems, Inc.	Scottsdale, AZ	70	AS, SI, NS
Electronic Data Systems (EDS)	Plano, TX	N/A	Outsrc, SI
First Data Corporation	Hackensack, NJ	145	ProcSvc, Tky
First Financial Management	Atlanta, GA	270	ProcSvc, Outsrc
HBO & Company	Atlanta, GA	237	AS, Tky, PS, Outsrc
Hewlett-Packard (Healthcare Info. Mgmt. Grp.)	Andover, MA	N/A	AS, PS, SI
IBM (Health Industry Unit)	Atlanta, GA	N/A	PS, SI
IDX	Burlington, VT	100	AS
Management Systems Associates	Raleigh, NC	N/A	AS, SI, PS
Medical Systems Corporation	Evanston, IL	35	AS, SI, Outsrc
MEDITECH	Westwood, MA	105	AS, Tky
Reynolds and Reynolds - National Medical Computer (NMC) Service	San Diego, CA	N/A	AS, Tky
Sachs Group	Evanston, IL	N/A	AS (databases)
Shared Medical Systems Corporation (SMS)	Malvern, PA	439	ProcSvc, Outsrc, NS
3M	Salt Lake City, UT	65	AS
Unisys	Blue Bell, PA	N/A	AS, PS, SI

Source: INPUT

B

Selected Vendor Profiles

The following vendor profiles are a representative sample of the companies offering information services and products to the health services industry.

Profiled are:

- Andersen Consulting
- Computer Sciences Corporation (CSC)
- Electronic Data Systems (EDS)
- First Financial Management
- Shared Medical Systems (SMS)

1. Andersen Consulting

69 West Washington Street

Chicago, IL 60602

Private

U.S. Healthcare Revenues: \$81,000,000

FYE: 12/31/93

a. Company Background

Andersen Consulting is a leading provider of management consulting, systems integration, outsourcing, and software products. It is the leading provider of systems integration solutions for the health care industry.

b. Strategy

Health care represents one of six principal industry-specific practices of Andersen Consulting. Targeted sectors of the health care industry include: integrated health systems; health insurers; managed care organizations; policy-making authorities; and purchasers.

Providing business process reengineering and change management, which includes the blending of people, processes, technology and strategy, is a major overall theme of Andersen Consulting's health care agenda.

Technology solutions are tightly integrated with business processes.

Major technology focus areas are in the building and managing of health care networks and in the development of integrated solutions based on client/server architectures that provide integrated health care delivery solutions.

A competitive advantage for Andersen Consulting is its integrated application development platform environment, which includes its CASE and object-oriented tools.

This expertise is particularly valuable for the development of computer-based patient records or data warehouses, which draw on data from a variety of real-time and transactional operation environments, as well as from a variety of information modalities such as voice, video, imaging, and data. This expertise will also provide the basis for the development of telemedicine applications.

The use of object-oriented application development technologies is also allowing Andersen Consulting to develop highly modular, customized health care applications. This is also increasing development productivity by a factor of three to ten times.

As a leading consultant to the health care industry, Andersen is also working closely with opinion leaders to help establish measures and standards of industry performance.

Health Strategy CenterSM (formerly Hospital of the FutureSM), based in Dallas, Texas, is one of its industry-focused demonstration centers. It is designed to assist health care organizations—providers, suppliers, intermediaries, policy-making authorities and purchasers—shape their vision of the future in health care information solutions.

A major recent contract has involved the creation of the Quality Report Card for the Northern California region of Kaiser Permanente, the largest U.S. health maintenance organization.

Examples of health services contracts include:

- The implementation of an integrated enrollment and billing system for Blue Cross/Blue Shield of Connecticut's indemnity products and HMOs that will administer both large groups (e.g. State of Connecticut) and individual members.
- A 10-year, \$50 million agreement with Voluntary Hospitals of America, Inc. (VHA) to install and manage a computer system that provides physicians and management at VHA member hospitals with comparative information on the cost and quality of patient care—even if their transaction systems are different. (Contract signed in the fall of 1990).
- The state of Washington selected Andersen Consulting to design the information system for the state's health care reform initiative.

- The National Marrow Donor Program (NMOP), which involved the development of the Search Tracking and Registry (STAR) System for facilitating the matching of volunteer donors with patients who have blood-related diseases. STAR, with a UNIX-based client/server architecture, automates communication throughout the NMDP's network of donor centers, transplant centers, bone marrow collection centers and testing laboratories. The STAR system has a workflow management component that enhances the search/match process. STAR also maintains a clinical database for bone marrow transplant research.

A key tool for the development of STAR is Andersen Consulting's Universal Construction Tool set (UCT), a CASE tool that provides a repository for the project's DESIGN/1 client/server development tool.

- Andersen Consulting and Inova Health Systems in Northern Virginia and the metropolitan Washington, D.C. area) partnered to create the Inova Research Information Systems (IRIS). IRIS is an enterprise-wide, patient-centered clinical database system for managers and physicians requiring immediate access to integrated data from information systems within Inova's corporate offices. IRIS contains data from most of the clinical and financial systems within the Inova Health System's corporate offices, hospitals, private practices of physicians and selected external entities, such as payors. The data is integrated within a central repository. Information managers and physicians can use the system to study trends in processes and outcomes of specific, user-defined cohorts of patients. It enables Inova and its affiliated physicians to gather, measure and act upon information for improving outcomes of care.

c. Products and Services

Andersen Consulting's areas of expertise include:

- Systems Integration:
 - Systems planning
 - Systems design
 - Systems building
 - Business reengineering
- Business Process Management:
 - Operations management/network integration
 - Applications management (development and maintenance)
 - Business function management

- Strategic Services:
 - Strategic management
 - Competitive and industry analysis
 - Marketing and sales planning
 - Logistics strategy
 - Organization change strategy

Managed care applications include the development of patient protocols and solutions for integrated managed care. Off-the-shelf products in this area are limited in number and variety. Andersen's consulting and software development expertise are key resources in developing client-specific health care applications and solutions.

2. Computer Sciences Corporation (CSC Healthcare Systems)

34505 West Twelve Mile Road, Suite 300

Farmington Hills, Michigan 48331

Public Corporation, (Subsidiary)

*U.S. Revenues: Est. \$35,000,000

FYE: 4/30/93

*INPUT Estimate

a. Company Background

The predecessor company to CSC Healthcare Systems (CSC) was Comtec, which was founded in 1974. Comtec was a data processing service bureau and also provided custom-developed software. Comtec was an early provider of managed care software. In 1986, Comtec was acquired by Computer Sciences Corporation.

Computer Sciences Corporation (CSC) also acquired another managed care software vendor, Seako, in 1989, which was merged with CSC Comtec in 1990 to form CSC Healthcare Systems. The Seako acquisition provided CSC with the PM 2000 Practice Management System and the MHS Managed Healthcare Information System.

b. Strategy

As the health care industry moves from fee-for-service plans to the new era of managed care, CSC Healthcare Systems plans aggressively to expand its capabilities for delivering outsourcing, systems integration and software products offerings for the managed care health care environment.

c. Products

Software products provided through CSC Healthcare Systems are primarily focused on managed care. Examples include:

- Focal Point™ Decision Support System—a multidimensional data management and analysis solution that provides access to summary and detailed information from a number of claims processing systems. Based on a client/server architecture, it consists of a Microsoft Windows-based executive information system (EIS) front end that can access data from various sources. The EIS allows managers to interactively retrieve data, in contrast to traditional fixed reporting EIS architectures.
- Ambulatory Care Group Case Mix System (ACG)—a case-mix methodology developed at Johns Hopkins University, for which CSC Healthcare Systems is the exclusive distributor. ACGs can be used to describe the "illness burden" of a population to help predict ambulatory care resource use.
- MHC Managed Healthcare Information System, a UNIX-based managed care claims and administration system, and the interfaced PM 2000 Practice Management System, an integrated solution that addresses needs of HMOs, PPOs, PHOs and other vertically integrated delivery systems.
- MHS Managed Healthcare Information System, an IBM mainframe and AS/400-based managed care claims and administration system for managed care organizations.

Computer Sciences, the parent company of CSC Healthcare Systems, has traditionally been a major factor in the federal government outsourcing market, and in recent years has had strong success in the U.S. commercial outsourcing market. CSC Healthcare Systems/Computer Sciences has been the beneficiary of such recent health care-related outsourcing contracts as:

- A \$55 million outsourcing contract with American Medical Response, a leading provider of emergency pre-hospital medical care and general ambulance services. The seven-year agreement includes three additional one-year options.
- The Joint Commission on Accreditation of Healthcare Organizations (JCAHO) signed a contract in June of 1994 with Computer Sciences Corporation that calls for CSC to receive, store and process data for the Joint Commission's Indicator Measurement System (IMSystem).

The contract calls for SCS to accept data from participating hospitals quarterly and to work with the Joint Commission to prepare comparative reports.

3. Electronic Data Systems Corporation (EDS)

5400 Legacy Drive

Plano, Texas 75024

Public Corporation: Health Care Information Services Programs

FYE: 12/31/93

a. Company Background

EDS is a leading provider of systems management (outsourcing) and systems integration, as well as other information services. Health care represents one of its seven principal industry-specific markets. Approximately 63% of EDS's total revenues in 1993 were from systems management and 21% from systems integration. The company does not break out specific health care information services revenues.

The company provides a broad range of products and services to 160 health care centers, including: HMOs, Blue Cross and Blue Shield, dentists, and the government, among others. In addition, EDS is a market leader in the government payor category and with HMOs and other managed care agencies.

Examples of major contracts in the health care provider market include:

- Blue Cross/Blue Shield of Maryland selected EDS to upgrade, expand and manage its existing LifeCard network. The new network, called the Maryland Health Information NetworkSM, will use advanced electronic data interchange technologies to facilitate the rapid exchange of health information among payors, doctors, hospitals, pharmacies and laboratories.
- The Northern California Region of Kaiser Permanente's selection of EDS to manage its Livermore, California, warehouse management system, which EDS had previously integrated.

b. Strategy

EDS has been servicing the health care industry for many years; health care is a major vertical market emphasis for the company. EDS provides both services and products to the health care market, including consulting, systems integration, outsourcing, professional services, processing services and product sales.

With its broad range of capabilities, EDS can provide a great deal of flexibility in its delivery mechanism. All of its business units sell vertical industry products and services. It is one of the leading providers of managed care applications.

c. Products and Services

- Software products include:
 - IPS - Interpractice System, an electronic medical record, developed with Harvard Community Health Plan and designed by doctors
 - TOPPS - A managed care administrative system for employers—provides a comparison report card for a particular community, hospital or physician, etc.
- Applications software and services - Delivered either as a standalone or integrated departmental solution. An example is COMPLETE (a joint venture of EDS and Dun & Bradstreet), a resource for building data warehouses (large data repositories that include customer data, data from employees, payor data, proprietary D&B databases (pharmaceuticals), and data analysis tools). COMPLETE facilitates the comparison of specific health care procedures on particular populations in particular regions, for quality reviews.
- Professional services - Consulting is offered in several areas of health care information services. An example of an area of current focus is consulting on systems development for HMOs.
- System integration - Focus is on a case management approach to claims processing, such as the development of client/server-based solutions for custom integration of claims and care competency.
- Outsourcing - Focus is on the larger payors—e.g., the Blue Cross/Blue Shield Groups. EDS provides a full outsourcing solution that includes all IT operations, and frequently telecommunications operations. EDS also provides co-sourcing—shared-risk fee-for-service contract alternatives—in which fees go up and down with the fortunes of the corporate client.
- Network services - EDS provides network delivery and systems integration for many of the CHINs developing around the U.S., including the Maryland Blue Cross/Blue Shield-Maryland Health Information Network, and the California CHIN—a partnership of Blue Cross, Take Care, Healthnet, Blue Shield and Prudential. EDS emphasizes intelligent network services, and continuously introduces new products in order to be competitive.
- Processing services - EDS has provided on-line electronic transaction claims processing since 1979, processing 600 million claims a year. EDS processes 51% of Medicaid and 25% of Medicare claims, and provides a full customer service operation to work with doctors on how to use the technology.

4. First Financial Management

3 Corporate Square, Suite 700

Atlanta, Georgia 30329

Public Corporation

U.S. Revenues: Health Care Services Unit, \$270,000,000

FYE: 12/31/93

a. Company Background

First Financial Management is a leading provider of vertically focused transaction processing and outsourcing services. Information services provided through its Merchant Services Unit include: merchant credit card authorization, processing and settlement; check guarantee and verification; debt collection and accounts receivable.

Through its FIRST HEALTH companies, First Financial Management provides a full range of integrated health care management services, including: third-party administration, psychiatric and chemical dependency services, managed care, utilization review, provider networks, data analysis and information processing systems, and Medicaid and pharmaceutical claims processing.

Founded in 1968, FIRST HEALTH provides state Medicaid agencies with health claims and information processing systems design, development and fiscal agent/intermediary services.

In July 1994, First Financial Management acquired GENEX Services, Inc., and GENEX Services of Canada Ltd. GENEX is a leading provider of workers' compensation programs, including medical case management, vocational rehabilitation, automated bill review, utilization management and other cost containment services. GENEX had over \$90 million in revenues in 1993. The acquisition should help First Financial Management achieve approximately \$400 million in revenues in its Health Care Services Division in 1994.

Approximately 62% of revenues in the Health Care Services Division are from claims processing and 38% from managed care outsourcing applications.

b. Strategy

FIRST HEALTH will continue to expand its original business, providing health care administration, such as claims processing services, to self-funded employers. An electronic funds transfer product and services will be added with the acquisition of Western Union. It will also focus on outsourcing of

data analysis/managed care services for large health care organizations as an alternative to such organizations having to develop extensive automated administrative systems themselves.

The FIRST HEALTH unit is focusing on state "alternative" programs for mental health and substance abuse, preventive care, wellness and pharmacy programs. FIRST HEALTH provides systems integration, database management, networks, data analysis, and the application of new technologies for such state programs. With its wide variety of administrative and managed care solutions, FIRST HEALTH has become a leader in health care automation and administration. FIRST HEALTH is also developing a paperless claims processing system, ACT3. This will allow FIRST HEALTH to increase the efficiencies of its claims processing services and also strengthens its capabilities as an outsourcing partner.

FIRST HEALTH Services is focused on the emerging markets in a number of states for Community Health Management Information Systems.

c. Products and Services

First Financial Management's products and services include:

- FIRST HEALTH Strategies, Inc., which offers a total program for handling third-party employee benefit programs for larger corporations with self-funding benefits. First Financial Management entered this business by acquiring Alta Health Strategies in 1992.

The company designs, develops and administers programs for corporations, including adjudication of claims, payment of claims, data analysis and utilization review.

Principal functions of FIRST HEALTH Strategies, Inc., include:

- Claims administration
- Health care management
- Provider networks
- Data analysis
- A fully automated, prescription drug management program
- Disability management
- Timeshare, which allows an employer to become a FIRST HEALTH claims office, receiving full access to staff, training, communications and distribution. FIRST HEALTH provides the mainframe equipment, operation and programming staff, storage facilities, technical support, printing and mailing.

FIRST HEALTH Services Corporation consists of three major divisions:

- **Government Health Care** - Provides Medicaid processing for state governments. It is the second largest provider in the market, with EDS and CSC as principal competitors. The company annually processes approximately 130 million health claims worth more than \$15 billion.
- **Pharmacy Benefit Administration** - Specializes in the support of large pharmacy programs and is a leader in drug utilization review administration, covering more than 10 million individuals.
- **Mental Health and Substance Abuse Managed Care** - Specializes in obtaining greater value from the delivery of mental health and substance abuse treatment services. It provides systems management services that cover approximately 6 million lives and more than \$650 million in health care utilization.

5. Shared Medical Systems Corporation (SMS)

51 Valley Stream Parkway
Malvern, PA 19355
Public Corporation
U.S. Revenue: \$439,000,000
FYE: 12/31/93

a. Company Background

Shared Medical Systems Corporation (SMS) is the largest health care information systems and services supplier. Founded in 1969, SMS became a publicly held corporation in 1976. The company's products and services are provided to hospitals, clinics and physician groups for financial, clinical, administrative and decision support applications under a wide range of delivery modes.

The company is organized into the following divisions:

- Hospital Systems Division
- Laboratory Products Division
- Turnkey Systems Division
- Physicians' Services Division
- Federal Systems Division
- SMS Europe

b. Strategy

The company is positioning itself to be the leading provider of regionally-based integrated health care network (IHNs) delivery systems. SMS is also focusing on providing enabling technology for managed care within and across health care enterprises.

The company's combined strengths in health care information systems solutions, network and database integration, outsourcing, network services and strategic consulting services help provide not only the ability to implement integrated health care delivery systems, but also to manage them on an outsourcing basis.

A significant strategic direction of the company is also to establish world-class alliances to better serve customer needs. On individual project-based collaboration, alliances can be with companies that SMS might compete with on other projects. One example of this is the Chicago CHIN project, which involves multiple partners.

A principal company strength is working with distributed processing solutions, which can involve a combination of remote processing at its Information Systems Center combined with client-based processing. This has helped the company develop interface tools for multivendor product integration and integration of multiple database structures in computer-based electronic medical records.

c. Products and Services

SMS operates the largest health care network in the United States: it consists of over two million miles of communications lines that connect more than 80,000 custom terminals and printers.

INPUT estimates that approximately 50% of SMS's revenue is derived from remote processing, systems operations (facilities management), and network services, with most of the remaining half split between software product licenses and turnkey systems. A smaller amount, between 5% and 10%, comes from professional services.

Recent professional services emphasis has been on business office and clinical reengineering in cooperation with firms such as Coopers & Lybrand and Ernst & Young.

In managed care applications, SMS works with customers to create critical paths that define the optimum sequencing and time intervals for entire episodes of care, from preadmission and inpatient services through rehabilitation, follow-up visits and outcomes measurement.

SMS is a pioneer in the development of health care-specific electronic data interchange products and services. Healthcare Data Exchange (HDX), a wholly owned subsidiary, facilitates the electronic communication of industry standardized information among all parties involved in the health care industry. For example, HDX electronically links the New York City Health and Hospital Corporation, consisting of seventeen different hospitals, with other enterprises comprised of hospitals, physicians groups, multispecialty clinics, laboratories, health insurers, government agencies, and financial institutions. The linkage is used for eligibility verifications, claims, and remittance transmissions.

SMS provides processing services to its hospital clients via the Information Systems Center. The Center processes data from more than 800 hospitals and physician groups using IBM 3090 computers, with more than 30,000 client terminals connected.

The company's primary market is acute-care hospitals—generally with 100 or more beds—and physician groups. SMS currently serves more than 1,300 hospitals and physician group practices. SMS software is installed on more than 1,000 client mainframes and minicomputers, with over 100 applications for financial, administrative, and clinical management.

SMS products and services include:

- INVISION[®] - An IBM-based clinical, financial, and decision support application, available either for purchase and in-house use, or as a remote processing service
- ALLEGRA[®] - A DEC VAX-based clinical, financial, administrative, and decision support application for community hospitals with 100 to 400 beds
- The UNITYSM distributed system, with clinical applications processed in-house on DEC or IBM computers, and financial applications processed remotely at the SMS Information Systems Center
- The DEC VAX-based Laboratory System for either a single hospital or a multi-entity networked environment
- Professional services, including education, custom programming, proprietary network design, system installation, and consulting
- A new generation of products being developed includes technologies for developing the Lifetime Clinical Record, an Enterprise Access Directory, and universal interfaces, utilizing SMS' OPENLink technology.



Conclusions and Recommendations

A

Conclusions

1. Health Services Industry Changes

The compelling trend to managed care is the key driver of change in this market. It has been thirty years (e.g., the advent of Medicaid and Medicare) since there have been changes of this magnitude. Managed care, however, is actually a larger change because:

- All strata of the population are affected.
- Many of the effects on institutional providers are perceived by them as quite negative (shrinkage, mergers, dissolution). At the least, a great deal of change in provider behavior is required by the new environment.
- The actual practice of medicine is being affected by external forces.

Managed care means real cost controls, balanced by the need to satisfy regulators and, equally important, compete in the marketplace.

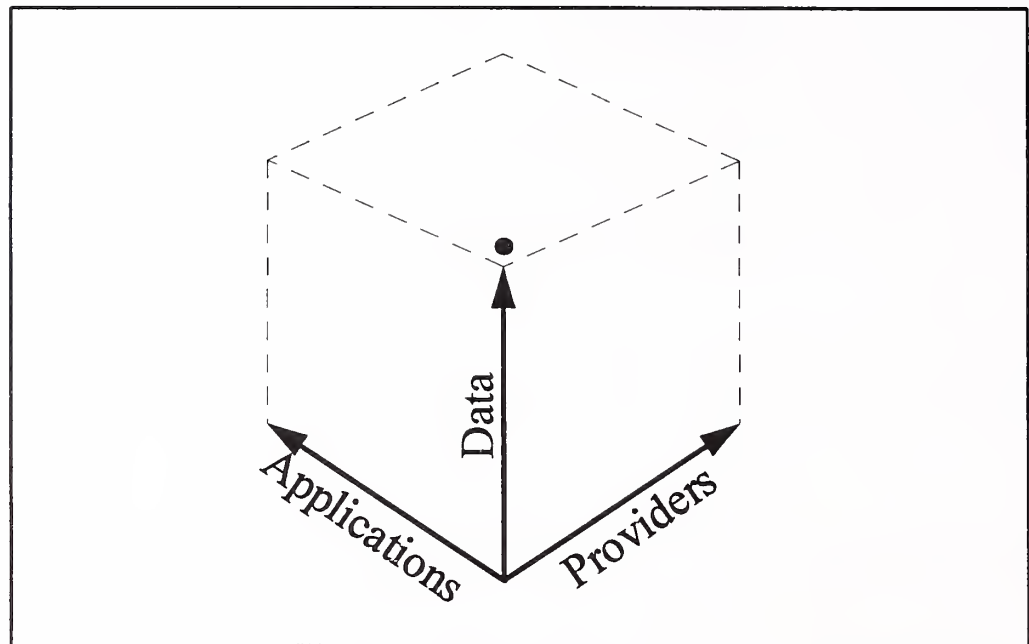
2. Implications for Information Services

The business implications of managed care will require an order of magnitude increase in integration, including data, applications and providers (see Exhibit VI-1).

This is consistent with the change from a "processing" to a "database" model of IS. The logical outcome of this is the development and use of megabases.

EXHIBIT VI-1

IS Integration in Health Care



Source: INPUT

These developments will make the current generation of applications at the provider level obsolete. The remainder of the 1990s will see evolution toward a new generation of provider-oriented applications. These applications will tend to be customized or semi-customized.

- Initially, this will occur because there will be neither the time or, in some cases, the technology to develop full-fledged packaged applications from scratch.
- As provider mergers increase, the number of buyers will decrease and, in many cases, the remaining provider groups may have unique needs, not easily met by a traditional package.

Exhibit VI-2 summarizes these findings.

EXHIBIT VI-2

Conclusions

Strong trend to managed care

Long-term order-of-magnitude shrinkage in number of providers

Real cost control, balanced by service competition

Business, application, data integration

- Within a provider
- Across providers

Change in emphasis from "processing" to "data" (megabases)

A new generation of applications

*Source: INPUT***B****Recommendations****1. Opportunity Areas**

INPUT sees very significant opportunities for vendors, both those with current health care offerings as well as new entrants. The opportunities fall under two broad headings: megabase-related and those supporting provider operations in the new environment.

Megabase-Related Opportunities - The most significant opportunities in this area are:

- Consulting and design of very large databases
- The initial construction, population and testing of the megabase(s)
- The distribution of publicly available data
- The operation of private megabases
- Advising on or conducting data analysis
- Providing "hooks" into current or new applications

Some vendors are beginning to offer megabase-related services; however, at this time, the field is essentially wide open.

Provider Operations Opportunities - There are many opportunities for helping providers adjust to the new environment. These include:

- Providing new packaged applications (across the entire spectrum of applications needed to enable a provider to function effectively).

These will be most effective if made up of "piece parts" that can be customized.

- Providing "hooks" into current or new applications. (This differs from the megabase opportunity with the same title, in that this looks at the linkage from the standpoint of operations.)
- Customized networks and applications—these go beyond the customization available from piece parts
- Outsourcing of some or all of IS/business-related functions

2. Opportunities by Type of Vendor

In principle, any type of vendor could pursue any opportunity. In reality, vendors will be limited by a combination of:

- Resources available (people and dollars)
- A vendor's base of knowledge
- Market position and perceptions
- A vendor's own view of its heritage ("We provide services"; "We provide software")

To assist in the initial phase of opportunity analysis, INPUT has performed a general assessment of opportunities for which particular classes of vendors are most suitable. This assessment is presented in tabular form in Exhibit VI-3.

- In INPUT's view, there are a number of opportunities for any type of vendor.
- Similarly, for any opportunity there are multiple types of vendors that can legitimately consider entering the market.

Note that there are several types of potential vendors that are not now considered suppliers to this market:

- Systems software firms. These firms may be critical in the technical design and implementation of very large databases.
- Managed care organizations/health insurers. Some of these firms may, in the medium term, be the most knowledgeable on megabase issues and provider networking.
- Providers and other non-profit organizations. Core providers may begin by supplying services to affiliated organizations and then branch out further. There are now a variety of non-profit organizations that have considerable expertise in the health database area.

The non-traditional suppliers may prove to be good partners for established health care information services providers.

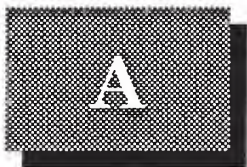
Obviously, there will be exceptions (in both directions) to these assessments, especially over time, as particular vendors stake out new territory.

EXHIBIT VI-3
Major Opportunities by Type of Product/Service Supplier

	Turnkey, Applications Software	Outsourcing, Processing Services	Professional Services, Systems Integration	Database Supplier	Systems Software	MCO, Health Insurer	Providers, Non-Profit Organizations
Megabase-Related							
Consulting/Design			x	x	x	x	x
Construction			x	x	x	x	
Distribution		x		x			
Operations		x		x			x
Analysis	x		x	x	x		x
"Hooks" to Applications	x		x				
Provider Operations							
New Applications	x		x				x
"Hooks" to Applications	x		x				
Customized Netwks, Applications		x	x			x	x
Outsourcing		x					x

Source: INPUT

(BLANK)



Forecast Database and Reconciliation

A

Forecast Database

The full information services forecast database for the health services industry sector is contained in Exhibit A-1. The values contained in the database are in millions of dollars. The values for various totals may vary slightly from amounts used in the charts, graphs and other exhibits in this document, because larger amounts in the exhibits are normally rounded for ease of presentation.

B

Database Reconciliation

Exhibit A-2 presents the reconciliation of INPUT's 1994 forecast for the health services industry with the 1993 forecast, for the years 1993 and 1998.

Forecast variations for the 1993 market were only 1% to 2%, reflecting the "wait and see" attitude prevalent during the period, as both health care providers and vendors waited for a final resolution of the initiatives proposed by the Clinton administration. The failure of the administration to obtain approval for a nation health care program did not immediately affect near-term and long-range budget projections by providers; hence the 1998 information services market forecasts show only slight variations—from 1% to 4%. INPUT expects that the 1995 report on this industry will show some spending increases, as health services providers revise budgets based upon current scenarios, and continue to seek the functional, cost and timing advantages offered by information services.

The compound annual growth rate (CAGR) for the health services industry for the period measured, 1993 to 1998, held steady at 12%—an increase equivalent to the growth of the total U.S. information services market for the

same period. The professional services CAGR increased by 1%, and turnkey systems decreased by that amount, while all other product/service categories maintained the growth rate forecast in 1993.

EXHIBIT A-1

Health Services
Market Size by Product/Service Sector, 1994-1999

PRODUCT/SERVICE SECTOR	1993 (\$M)	Growth 93-94 (%)	1994 (\$M)	1995 (\$M)	1996 (\$M)	1997 (\$M)	1998 (\$M)	1999 (\$M)	CAGR 94-99 (%)
INDUSTRY TOTAL	5419	12%	6044	6721	7516	8499	9647	10984	13%
Professional Services	319	10%	350	379	412	454	507	572	10%
- IS Consulting	78	12%	87	96	107	119	133	157	13%
- Education & Training	45	11%	50	55	61	67	74	84	11%
- Software Development	196	9%	213	228	244	268	300	331	9%
Systems Integration	310	18%	366	438	515	609	721	866	19%
- Equipment	107	19%	127	148	170	197	226	256	15%
- Software Products	28	29%	36	45	56	68	79	90	20%
- Professional Services	175	16%	203	245	289	344	416	520	21%
Outsourcing	1258	13%	1416	1585	1783	2041	2339	2681	14%
- Platform Operations	497	8%	538	575	613	662	719	774	8%
- Applications Operations	462	10%	508	561	622	702	775	878	12%
- Desktop Services	157	17%	183	205	239	280	334	424	18%
- Network Management	142	32%	187	244	309	397	511	605	26%
Processing Services	553	5%	582	599	622	655	680	706	4%
- Transaction Processing	553	5%	582	599	622	655	680	706	4%
Network Services	671	18%	795	904	1048	1232	1448	1712	17%
- Electronic Information Svcs	386	13%	435	486	543	614	715	827	14%
- Network Applications	285	26%	360	418	505	618	733	885	20%
Applications Software	1237	12%	1385	1600	1856	2146	2495	2887	16%
- Mainframe	414	6%	437	451	484	509	538	610	7%
- Minicomputer	335	7%	360	385	408	439	468	530	8%
- Workstation/PC	488	20%	588	764	964	1198	1489	1747	24%
Turnkey Systems	1071	7%	1150	1216	1280	1362	1457	1560	6%
- Equipment	497	4%	517	531	553	570	585	607	3%
- Software Products	400	9%	435	463	512	561	610	656	9%
- Professional Services	174	14%	198	222	215	231	262	297	8%

Source: INPUT

EXHIBIT A-2

Health Services 1994 MAP Data Base Reconciliation

Product/Service Sector	1993 Market				1998 Market				93-98	93-98
	1993 Market (Fcst) (\$M)	1994 Report (Actual) (\$M)	Variance From 1993 Forecast		1993 Market (Fcst) (\$M)	1994 Report (Fcst) (\$M)	Variance From 1993 Forecast		CAGR per data '93 Rpt (%)	CAGR per data '94 Rpt (%)
			(\$M)	(%)			(\$M)	(%)		
Total	5339	5419	80	1%	9449	9647	198	2%	12%	12%
Professional Services	314	319	5	2%	490	507	17	3%	9%	10%
Systems Integration	305	310	5	2%	692	721	29	4%	18%	18%
Outsourcing	1240	1258	18	1%	2278	2339	61	3%	13%	13%
Processing Services	545	553	8	1%	675	680	5	1%	4%	4%
Network Services	661	671	10	2%	1420	1448	28	2%	17%	17%
Applications Software	1219	1237	18	1%	2430	2495	65	3%	15%	15%
Turnkey Systems	1055	1071	16	2%	1464	1457	-7	0%	7%	6%

Source: INPUT

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